

A microphone has a weight W of 6.0 N . It is suspended by wire X from the ceiling in a radio studio.

Fig. 1.1 shows the microphone held in the correct position by a horizontal wire Y.

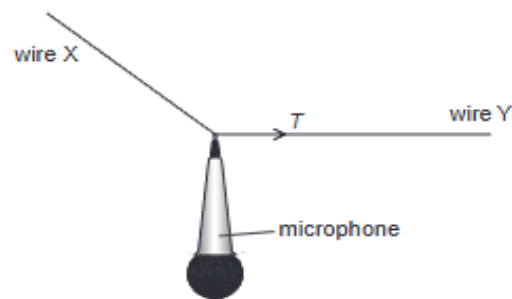


Fig. 1.1

- (a) The tension T in wire Y is 8.0 N . Use a vector diagram to determine the magnitude and the direction of the resultant of W and T .

magnitude =

direction =

[4]

A parachutist of total weight 950 N falls vertically at a constant velocity of 6.5 m/s.

- (b) At a certain height, the wind starts to blow and the parachutist moves horizontally at a velocity of 4.5 m/s as he continues to fall.

Use a graphical method to add together the horizontal and the vertical velocities to determine the size of the resultant velocity of the parachutist. Label the velocities and state the scale that you use.

size of velocity =

scale =

[3]

Two small tugboats are pulling a large ship in a harbour. Fig. 1.1 represents the view from above and shows the directions of the forces on the ship.

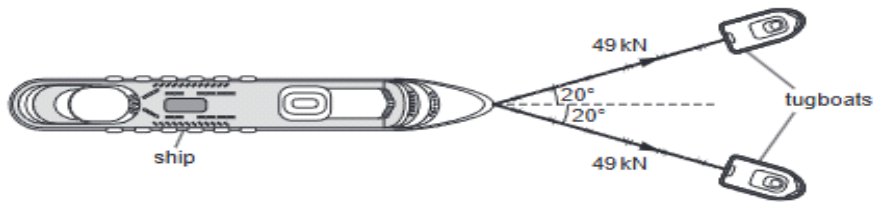


Fig. 1.1 (not to scale)

Each of the tugboats is exerting a force of 49 kN on the ship.

(a) Determine by a graphical method the resultant of these two forces and state the scale used.

scale

resultant = [3]

Force is a vector quantity and mass is a scalar quantity.

- (a) (i) State how a vector quantity differs from a scalar quantity.

.....
..... [1]

- (ii) State one other vector quantity and one other scalar quantity.

vector quantity

scalar quantity [2]

- (b) An aeroplane flies through the air in a straight line, with its engines at full power. The weight of the aeroplane is 160 kN. There is also a force of 320 kN acting upwards on the aeroplane at 30° to the horizontal.

In the space below, use a graphical method to determine the size and the direction of the resultant of these two forces. Use a scale of 1.0 cm : 40 kN.

size of resultant force =

direction of resultant force = [4]

A set of traffic lights hangs from the end of a metal cable. A horizontal chain pulls the traffic lights to the right so that they are above the middle of the road. Fig. 1.1 shows the metal cable inclined to the vertical.

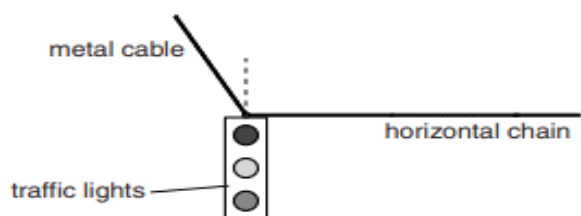


Fig. 1.1

The weight of the traffic lights is 240 N.

- (a) Two of the forces on the traffic lights are the tension in the horizontal chain and the weight of the traffic lights.

On Fig. 1.1, mark

- (i) an arrow that represents the tension in the horizontal chain, [1]
 - (ii) an arrow that represents the weight of the traffic lights. [1]
- (b) The tension in the horizontal chain is 140 N. Use a scale diagram to determine the size of the resultant of the weight and the tension in the chain. State the scale used for the diagram.

scale =

resultant force =

[3]

A bus breaks down on a road with a 10° upward slope. The passengers get out and push the bus to the top of the slope at a constant speed. Fig. 10.1 shows the passengers exerting a force on the bus parallel to the line of the slope.



Fig. 10.1

- (a) The total weight of the bus is 32000 N.
- (ii) On Fig. 10.1, draw two arrows to show the direction of the weight of the bus and the direction of the force exerted on the bus by the passengers. [1]
- (iii) The total force exerted by the passengers on the bus is 17000 N along the line of the slope. Use a graphical method to determine the size and direction of the resultant of this force and the weight of the bus. State the scale used.

scale =

size of resultant =

direction of resultant =

[4]

A journey consists of two displacements: the first is 500 m in a northerly direction and the second is 200 m in an easterly direction.

(a) In the space below draw, to scale, a vector diagram of these displacements.

State the scale of your diagram.

On your diagram, show the two displacements and the resultant displacement.

Determine the size (magnitude) and direction of the resultant displacement.



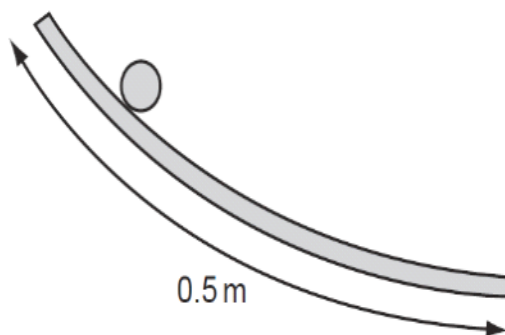
scale =

size =

direction =

[3]

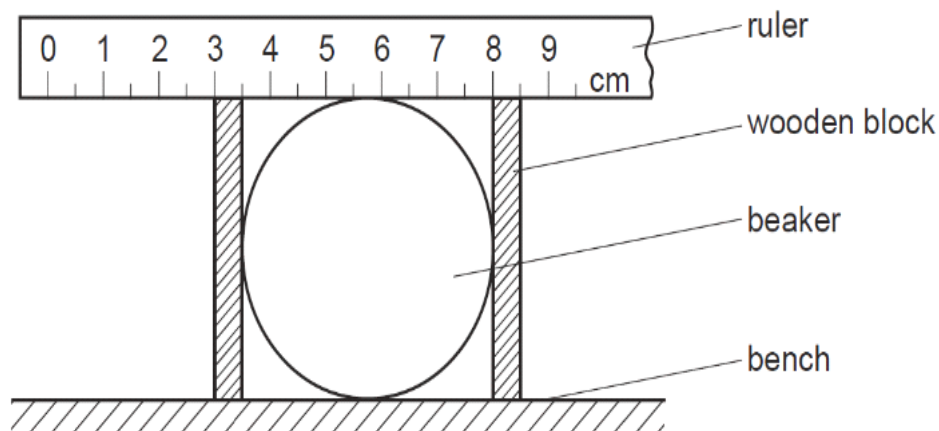
In an experiment, a ball is rolled down a curved track that is about half a metre long.



Which measuring device should be used to measure the length accurately?

- A** metre rule
- B** micrometer
- C** tape measure
- D** vernier calipers

The diagram shows one method of measuring the diameter of a beaker.



What is the diameter of the beaker?

- A** 4.5 cm
- B** 5.0 cm
- C** 5.5 cm
- D** 8.0 cm

Power is measured in watts.

What is the correct symbol for millions of watts?

- A** mw **B** mW **C** Mw **D** MW

What is the correct unit for the quantity shown?

	quantity	unit
A	electromotive force (e.m.f.)	N
B	latent heat	J
C	pressure	kg / m ³
D	weight	kg

What is the name and value of the unit of power written as mW?

	name	value
A	megawatt	10 ⁻³ W
B	megawatt	10 ⁶ W
C	milliwatt	10 ⁻³ W
D	milliwatt	10 ⁶ W

What is a possible mass for a normal adult person?

- A** 7.5 kg **B** 75 kg **C** 750 kg **D** 7500 kg

The following statements are about motion.

- 1 A plane flies due East for 600 km.
- 2 A runner's average speed in a race around a track is 5 m/s.
- 3 A snail crawls at 3 mm/s in a straight line towards a lettuce.
- 4 A tourist travels 500 km on a journey.

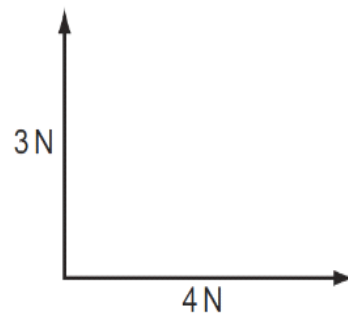
Which statements describe vector quantities?

- A** 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 2 and 4

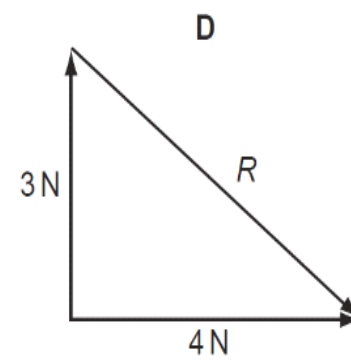
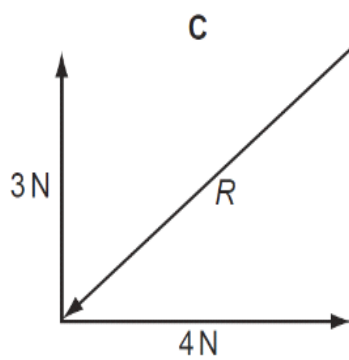
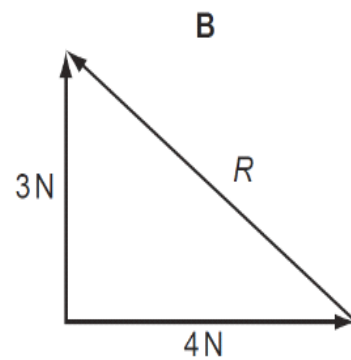
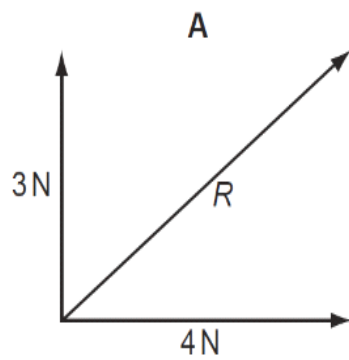
Which pair of quantities includes one scalar and one vector?

- | | | |
|----------|-------------|----------|
| A | mass | time |
| B | temperature | time |
| C | temperature | velocity |
| D | velocity | weight |

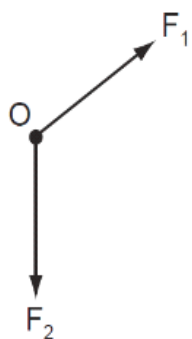
Forces of 3 N and 4 N are acting as shown in the diagram.



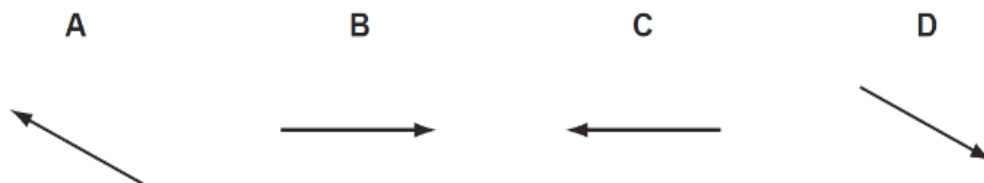
Which diagram may be used to find the resultant R of these two forces?



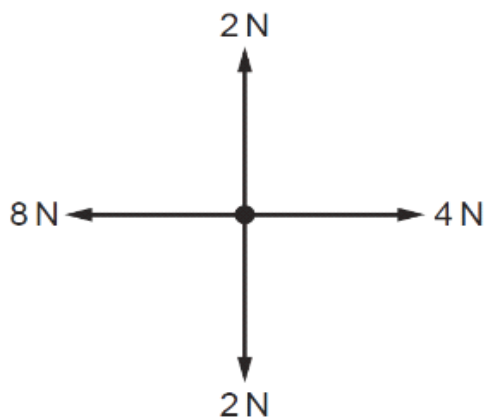
Two forces F_1 and F_2 act on an object O in the directions shown.



What is the direction of the resultant force?



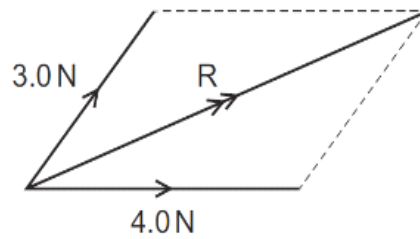
Four forces act at a point as shown.



What is the size of the resultant force?

- A** 0 N **B** 4 N **C** 6 N **D** 8 N

The diagram shows the resultant R of a 3.0 N force and a 4.0 N force acting at a point.

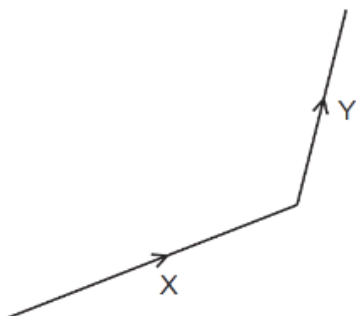


The angle between the 3.0 N force and the 4.0 N force can be any value from 0° to 90° .

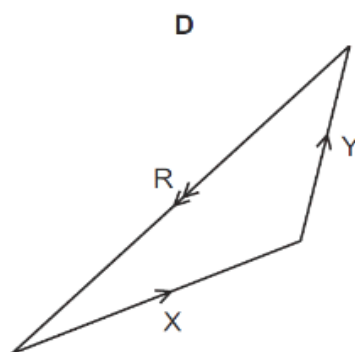
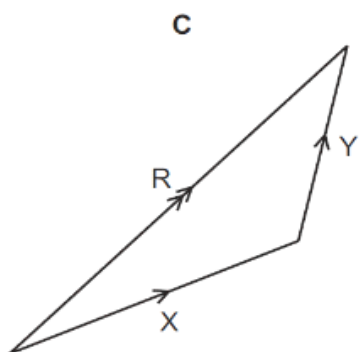
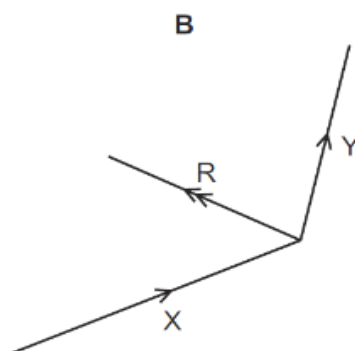
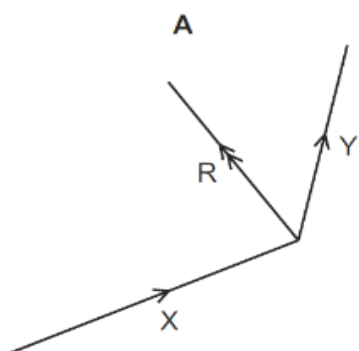
Which value of R is **not** possible?

- A** 4.0 N **B** 5.0 N **C** 6.0 N **D** 7.0 N

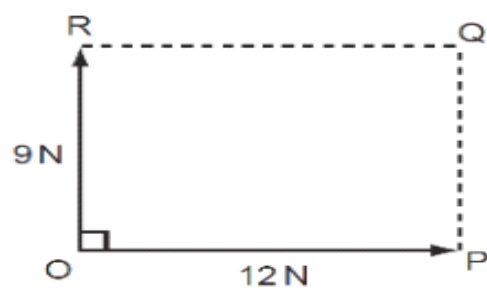
Two forces X and Y act as shown.



Which diagram shows the resultant force R of X and Y?



Two forces act at right angles at a point O as shown.



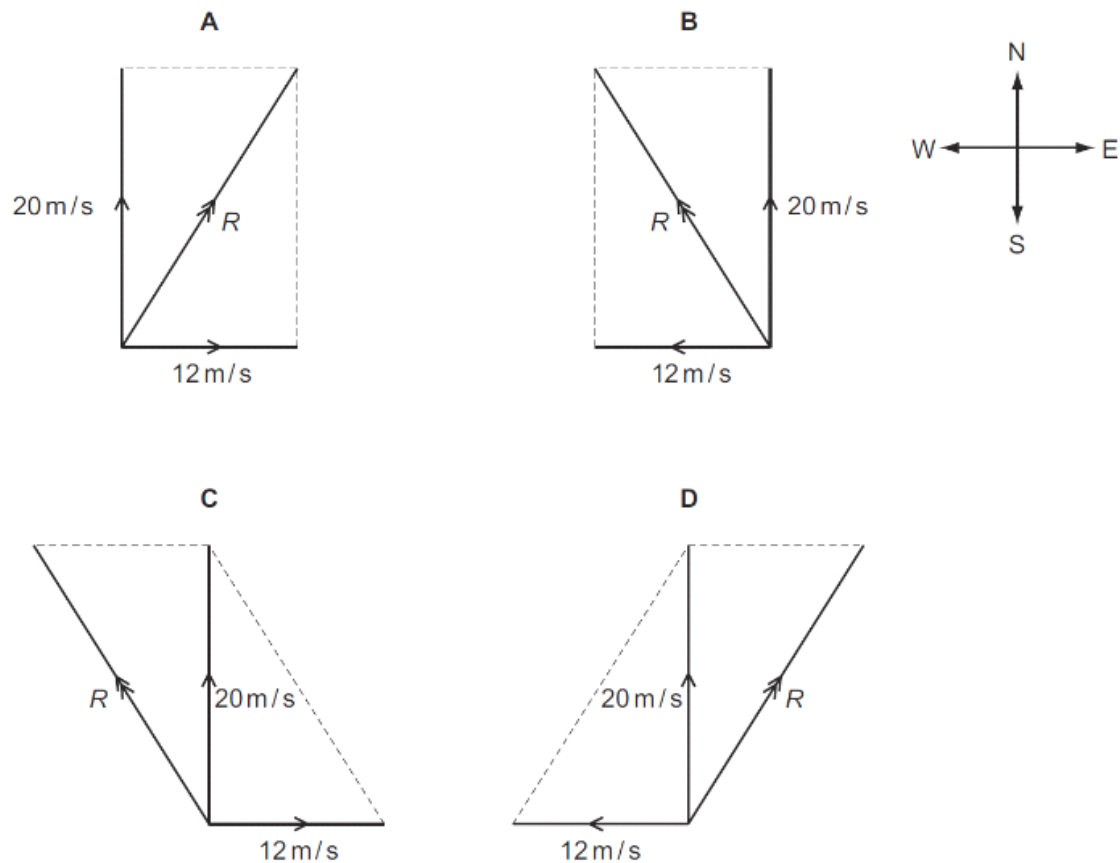
What is the resultant of the forces?

	magnitude	direction
A	15 N	OQ
B	15 N	PR
C	21 N	OQ
D	21 N	PR

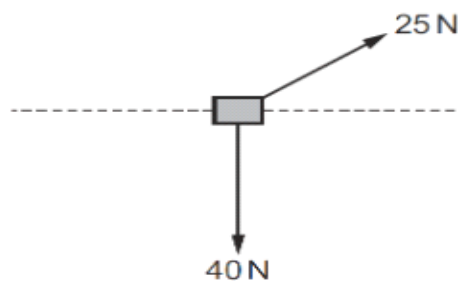
When there is no wind, the engines of an airship push it due north at 20 m/s .

The wind is blowing from the west at 12 m/s .

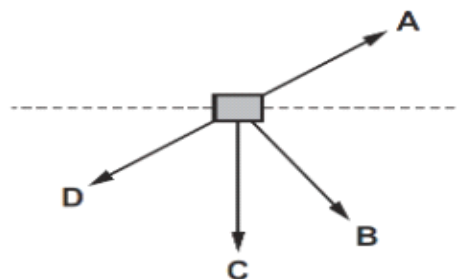
Which vector diagram correctly shows how the resultant velocity R of the airship is obtained?



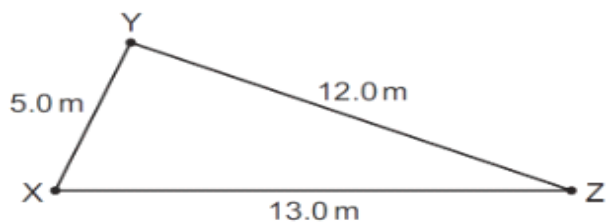
Forces of 25 N and 40 N act on an object in the directions shown.



Which arrow shows the direction of the resultant force on the object?



Paths are laid as shown between points X, Y and Z.



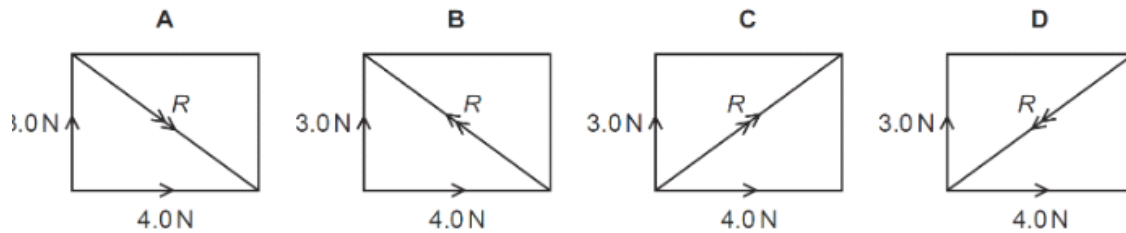
A person walks along the paths from X to Y to Z and then back to X.

What is the value of the total displacement and of the total distance travelled?

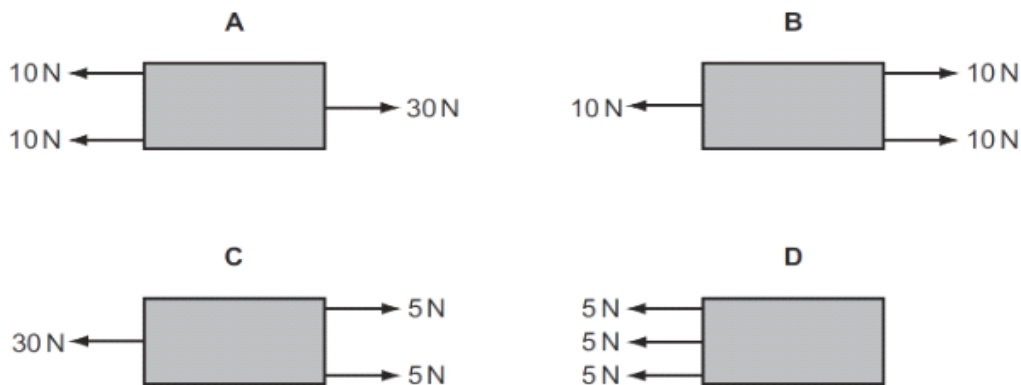
	total displacement / m	total distance travelled / m
A	0	0
B	0	30
C	30	0
D	30	30

Two forces of 3.0 N and 4.0 N act at right-angles to each other.

Which diagram shows the resultant R of these forces?



Which object has the largest resultant force?



A student studies some equations.

$$\text{power} = \text{work} / \text{time}$$

$$\text{force} = \text{mass} \times \text{acceleration}$$

$$\text{velocity} = \text{displacement} / \text{time}$$

How many vector quantities are contained in the equations?

- A** 1 **B** 2 **C** 3 **D** 4