10 Motion Graphs; Displacement–Time (s–t)

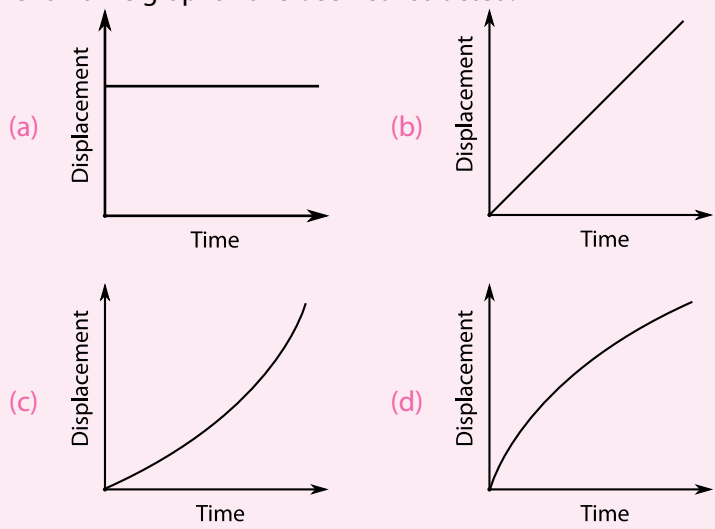
A displacement-time graph has displacement on the y-axis (the vertical axis) and time on the x-axis (the horizontal axis). The gradient of the line at any point is the velocity at that instant.
To review gradient calculations, see Straight Line Graphs - P14.

Take particular care of the unit for the gradient. It will be equal to the unit on the y-axis divided by the unit on the x-axis. For example, if displacement is measured in km on the y-axis and time in minutes on the x-axis, the gradient would have units of km per minute.

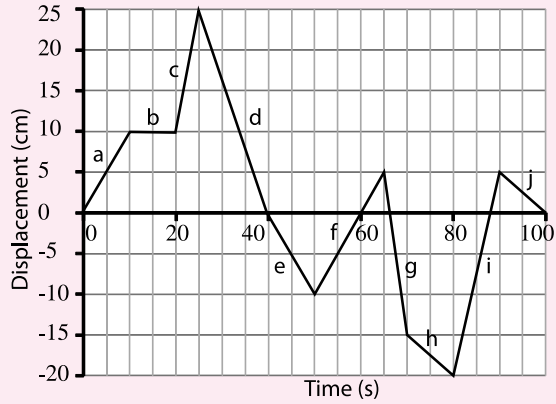
When displacement is on the y-axis, the direction of the displacement is equal to the direction of the velocity, unless the gradient has a negative value, in which case the direction of the velocity is opposite to the direction of the displacement.

When distance is on the y-axis instead of displacement, the gradient equals speed instead of velocity.

10.1 Describe the motions of the object for which the following displacement – time graphs have been constructed.



10.2 For the graph below, calculate the velocity for each labeled section a – j.



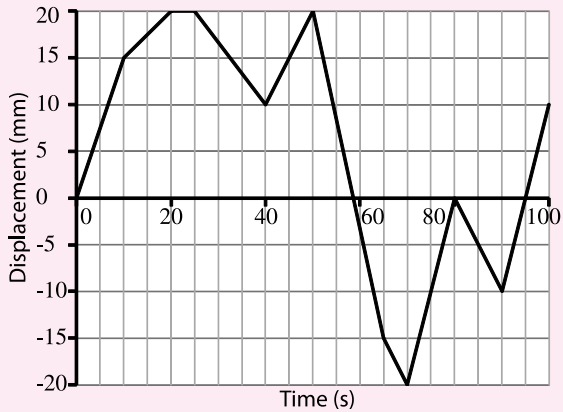
10.3 Considering the graph below:

(a) Between which times is the velocity most negative? Calculate the velocity between these times.

(b) Between which times is the velocity most positive? Calculate the velocity between these times.

(c) Between which times is the speed highest? Calculate the speed between these times.

(d) Between which times is the speed lowest? Calculate the speed between these times.



14/18