MOTION SUMMARY

Kinematics

Distance is how far an object has travelled without worrying about direction.
Position is the distance and direction from an arbitrary zero - a convenient place to start measuring.
Displacement is the final position minus the initial position.
Average speed equals total distance travelled divided by the time taken to move.
Av. speed is the constant speed needed to cover the given distance in the same time.
To convert kilometers per hour to metres per second, multiply by 1000 and divide by 3600.
To convert kilometers per hour to metres per second, divide by 3.6.
To convert metres per second to kilometers per hour, multiply by 3.6.
Instantaneous speed is the speed at one instant in time.
The instantaneous speed is the gradient of a distance versus time graph.
Velocity is the speed plus the direction of motion of the object.
The instantaneous velocity is the gradient of a position or displacement versus time graph.
When acceleration is constant, the average velocity is equal to the initial velocity plus the final velocity divided by 2.
When the acceleration is constant, the average speed and the instantaneous speed are the same at the mid point in time.
Average acceleration is the constant rate of change in velocity that will cause the same change in velocity to occur in the given time.
Average acceleration equals the final velocity minus the initial velocity divided by the time.
Instantaneous acceleration is the acceleration at one point in time.
Instantaneous acceleration is the gradient of the velocity versus time graph.
An object has positive acceleration when moving in the positive direction and getting faster or moving in the negative direction and getting slower.
An object has negative acceleration when moving in the negative direction and getting faster or moving in the positive direction and getting slower.
An object is still accelerating during an instantaneous stop.
The area under a speed versus time graph equals the distance travelled.
The area under a velocity versus time graph is the displacement.
Areas above the time axis are positive and those below are negative.
The area under an acceleration versus time graph is the change in the velocity.

Multi flash analysis

To find the speed at one of the pictures, divide the distance between the picture before to the picture after by twice the time between flashes.
To find the acceleration at one of the pictures, subtract the distance before from the distance after and divide by the time between pictures squared.

Equations of uniform acceleration.

The final velocity equals the initial velocity plus the acceleration times the time.
The displacement equals the initial velocity times the time plus a half times the acceleration times the square of time.
The final velocity squared equals the initial velocity squared plus twice the acceleration times the displacement.