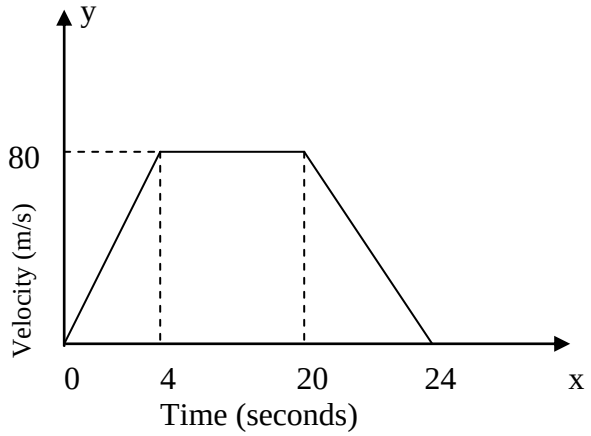
1. Linear motion

1. A passenger train travelling at 25km/h is moving in the same direction as a truck travelling at 30km/h. The railway line runs parallel to the road and the truck takes 1 ½ minutes to over take the train completely.
   a) Given that the truck is 5 metres long determine the length of the train in metres. (6 marks)
   b) The truck and the train continue moving parallel to each other at their original speeds. Calculate the distance between them 4 minutes and 48 seconds after the truck overtakes this train. (4 marks)
2. Two passenger trains A and B, 240m apart are travelling at 164km/h and 88km/h respectively approach one another on a straight railway line. Train A is 150 metres long. Determine the time in seconds that elapses before the two trains completely pass each other. (3mks)
3. A minibus covered a distance of 210km at an average speed of 90km/h. If it travelled ⅔ of the distance at a speed of 105 km/h, at what speed did it travel the rest of the distance? (3mks)
4. Two buses P and Q leave Kisumu at 7.30 am and 9.30 am respectively. If their speeds are 60km/h and 100km/h respectively, find when Q catches up with P. (3mks)
5. (a) A boat's speed in still water is 4km/h. It cruises in a section AB of a river whose speed downstream is x km/h. If the boat takes 2 hrs more in return journey and AB = 6km. find the value of x and the total duration of the journey (8mks)
   (b) The whole journey in (a) above ended at 3.34am. Find the departure time in 24 hour clock system (2mks)
6. The figure below is a velocity time graph for a car.



   (a) Find the total distance traveled by the car. (2 marks)
   (b) Calculate the deceleration of the car. (2 marks)
7. A bus started from rest and accelerated to a speed of 60km/h as it passed a billboard. A car moving in the same direction at a speed of 100km/h passed the billboard 45 minutes later. How far from the billboard did the car catch up with the bus? (3mks)
8. Nairobi and Eldoret are each 250km from Nakuru. At 8.15am a lorry leaves Nakuru for Nairobi. At 9.30am a car leaves Eldoret for Nairobi along the same route at 100km/h. Both vehicles arrive at Nairobi at the same time.

   (a) Calculate their time of arrival in Nairobi (2mks)

(b) Find the cars speed relative to that of the lorry. (4mks)

(c) How far apart are the vehicles at 12.45pm. (4mks)

9. A train whose length is 86 metres is traveling at 28 km/h in the same direction as a truck whose length is 10 metres. If the speed of the truck is 60 km/ h and is moving parallel to the train. Calculate the time it takes the truck to overtake the train completely. (3mks)

10. The distance between towns A and B is 360km. A minibus left A at 8.15am and traveled towards B at an average speed of 90km/hr. A matatu left B two and a third hours later on the same day and traveled towards A at an average speed of 110km/hr.

a) i) At what time did the two vehicles meet?

ii) How far from A did the vehicles meet?

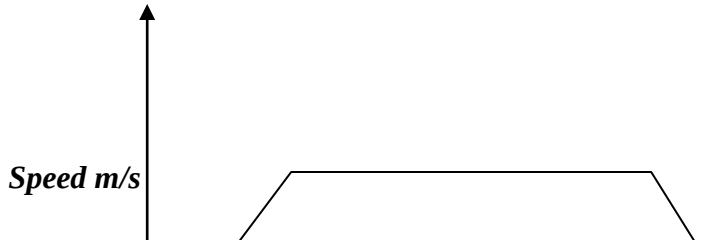
b) A motorist started from his home at 10.30am on the same day and travelled at an average speed of 100km/hr. He arrived at B at the same time as the minibus. Calculate the distance from A to his house. (10 mks)

11. A track traveling at 60 km/hr takes 1 hour 20 minutes more than a van traveling at 80 km/hr to cover the distance from Thika to Eldoret
Calculate:
a) The distance from Thika to Eldoret (2 marks)
b) If the track leaves Thika at 2230 hrs and the van leaves Thika 30 minutes later, find the time the van catches up with the track (3 marks)
c) At 2330 hrs a saloon car left Eldoret for Thika traveling at 120 km/hr and met the van at town K. find :
   I. The time they met (3 marks)
   II. The distance between town K and the track at the time in C(I) above (2 marks)

12. Two motorists Kinyua and Nyaboke travelled between two towns K and M which are 580km apart. Kinyua started from K at 6.20 a.m and traveled towards M at 90km/hr. Nyaboke started from town M $1\ ^{2}/_{3}$ hours later and traveled towards town K at an average speed of 120km/h. At a small shopping centre along the way, Kinyua had a snack and car check for 20 minutes before proceeding
   (a) (i) How far from town M did they meet?
   (ii) At what time did they meet?
   (b) A rally driver starts from town **M** going to town k at 9.30a.m. If he averages 180km/hr, Calculate the distance from **K** and the time when the rally driver overtook Nyaboke

13. The distance between two towns A and B is 150km. A car starts from town A at 10.00a.m and travels at an average speed of 80km/h towards B. A transit lorry travels from B at 10:15a.m towards town A at an average speed of 40km/h. At what time will the two vehicles meet?

14. The diagram below shows the speed-time graph for a bus traveling between two towns. The bus starts from rest and accelerates uniformly for 50seconds. It then travels at a constant speed for 150seconds and finally decelerates uniformly for 100seconds.



Given that the distance between the two towns is 2700m, calculate the ;
(a) maximum speed in km/h, the bus attained
(b) acceleration
(c) distance the bus traveled during the last 50seconds
(d) time the bus takes to travel the first half of the journey

15. A cyclist covers a distance of 45 kilometres at a speed of 10km/h and a further 45 kilometres at 15km/h. Find his average speed for the journey

16. A lorry left town **A** for town **B** 1¼ hours before a car. The lorry and the car are traveling in the same direction at 80kmh^{-1} and 120kmh^{-1} respectively. After the overtake, the car moved for $\frac{\mathbf{199}}{\mathbf{800}}$ another hours before reaching town **B**. Calculate:
(a) The time the car took before overtaking the lorry completely
(b) The distance between the two towns
(c) The time the lorry will take to reach town **B** after the arrival of the car

17. A country bus left Nairobi at 10.45a.m and traveled towards Mombasa at an average speed of 60km/h. A matatu left Nairobi at 1:15p.m on the same day and traveled along the same road at an average speed of 100km/h. The distance between Nairobi and Mombasa is 500km.
(a) Determine the time of the day when the matatu overtook the bus
(b) Both vehicles continue towards Mombasa at their original speeds. How long had the matatu waited before the bus arrived?

18. Two passenger trains **A** and **B** which are 240m apart are travelling at 164km/h and 88km/h respectively approach on another one a straight railway line. Train **A** is 150m long and train **B** is 100m long. Determine the time in seconds that elapses before the two trains completely pass each other

19. A bus 5m long completely overtakes a trailer 15m long travelling in the same direction in 4.8. seconds. If the speed of the bus is 40 km/hr, determine the speed of the trailer in km/hr.

20. Find the LCM and GCD of the following numbers: $2 \times 3 \times 5^3$ and $2^4 \times 3^2 \times 5^2$.

21. A boat sails from a point A to a point B upstream, a distance of 30 km and back to A in 3hrs 12 min. The current in the river is flowing at 5km/hr. Determine the speed of the boat in still water.

22.. Two friends Ojwang and David live 40 km apart. One day Ojwang left his house at 9.00 a.m. and cycled towards David's house at an average speed of 15 km/h. David left his house at 10.30 a.m. on the same day and cycled towards Ojwang's house at an average speed of 25 km/h.
a) Determine ;
(i) The distance from Ojwang's house, where the two friends met.

(ii) The time they met.
(iii) How far Ojwang was from David's house when they met.

b) The two friends took 10 minutes at the meeting point and they cycled to David's house at an average speed of 12 km/h. Find the time they arrived at David's house.

23. Mr. Kamau left town **S** at 6.00a.m and travels at an average speed of 24km/hr towards **R**. Mrs. Ronoh left town **R** to town S 10minutes later and arrived at 7.00a.m. If distance **RS** = 42km , find;

(a) Where and when they will meet
(b) The time Kamau arrived at **R**
(c) If at 7.00a.m another traveler left **S** and travels towards R at speed twice that of Mrs. Ronoh, find where and when Mr. Kamau was overtaken by the traveler if so

24. A train 100m long travelling at 72km/hr, overtakes another train traveling in the same direction at 56km/hr and passes it completely in 54 seconds.

i) Find the length of the second train

ii) Find also the time they would have taken to pass one another if they had been traveling at these speeds in opposite directions

25. An unskilled worker may either walk to work along a route 5km to take a bus journey of 7km. The average speed of the bus is 24km/hr faster than his average speed. Taking the average walking speed as **x** km/hr;

(a) Write down expressions for time of the journey;
(i) When walking
(ii) When using the bus
(b) The journey by bus takes 36 minutes less than the journey on foot, find his walking speed
(c) Hence find the time he takes to talk to work

26. At 1.50 p.m. a matatu is traveling at 80 km/h and it is 40 km behind a motorcycle traveling at 60 km/h.

(a) After how long will the matatu overtake the motorcycle?
(b) At what time will the matatu overtake the motorcycle?

27. A bus left Nairobi at 8:00a.m and traveled towards Kisumu at an average speed of 80km/h. At 8.30a.m, a car left Kisumu towards Nairobi at an average speed of 120km/hr. Given that the distance between Nairobi and Kisumu is 400km, Calculate:-

(a) The time the car arrived in Nairobi
(b) The time the two vehicles met
(c) The distance from Nairobi to the meeting point
(d) The distance of the bus from Kisumu when the car arrived in Nairobi

28. Two trucks A and B travelling at 28km/hr and 26km/hr respectively approach one another on a straight road. Truck A is 10m long, while truck B is 15m long. Determine the time in seconds that elapses before the trucks completely pass each other