1. Four friends James, Samantha, Zarin and Ruby took part in a relay race consisting of two phases. The first phase of the relay race is divided into three equal parts. They aimed to complete their first phase at an average speed of 7 m/s. James went first from the starting point and ran at a speed of 6 m/s, followed by Samantha at 8 m/s.

   a. At what speed did Zarin need to run to maintain their target average speed for the first phase?

   b. The second phase of the race consisted of sprinting back to the starting point. What was the average speed of their entire race if Ruby completed the second phase with a speed of 6 m/s?

2. The employees at an NGO are awarded increments on their salary according to the following policy: no increment in the first year, 5% for each of the next two years, and 13% from the fourth year onward.
   a) What is the average yearly rate of increment over the first 4 years? [2 marks]
   b) If an employee starts with a salary of Tk. 33,000, what will be their salary after 5 years of employment?

Answers:

a) $(1*1.05*1.05*1.13)^{1/4} = 1.0565$

b) $(1*1.05*1.05*1.13*1.13) * 33{,}000 = 46456.81$

3. Mr. A purchased shares of a company for $40. Over the next 3 years, the value of the shares increased by 3%, 15% and 6% respectively.

   a) What was the average annual rate of change in the value of the shares over the first 3 years?

   b) What will be the value of Mr. A's shares after 4 years if the shares fell by 7% in the fourth year?

Answers:

a) $(1.03*1.15*1.06)^{1/3} = 1.078815$

b) $(1.03*1.15*1.06*0.93) * 40 = 46.7072$

4. Corridor Digital is producing an animated short film with three scenes of 25000 frames each. They set a target to maintain an average pace of 50 frames/hour for animating all three scenes. The first two scenes were animated at a pace of 55 frames/hour and 65 frames/hour respectively.

    a. What pace do they need to maintain for the third scene if they are to reach their target?

    b. After the animations are complete, the entire film needs to be rendered out. The rendering was done at a pace of 80 frames/hour. What was the average pace for the entire process of animating and rendering the film?

Answers:

ansA = 1/(3/50 - (1/55 + 1/65))

ansB = 2/(1/50 + 1/80)