

Mathematics 25.08.22 (2) Notes

Eason Shao, Mr Finch-Noyes

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Section 1 Money Conversion

Example 1.1. (Money Conversion) Euro1 = £0.84 = s\$1.39. Euro29.04 to £: 24.39£. s\$74.08 to Euros: Euro53.29. £90 to s\$: s\$148.93.

Section 2 Ratio

Example 2.1. (Ratio) \$3600 is shared in the ratio 4 : 6 : 8.

(1) Can we simplify this ratio? $4 : 6 : 8 = 2 : 3 : 4$.

(2) What does each person get? Each part is $\$3600 \div (2 + 3 + 4) = \400 . $\$400 \times 2 = \800 , $\$400 \times 3 = \1200 , $\$400 \times 4 = \1600 .

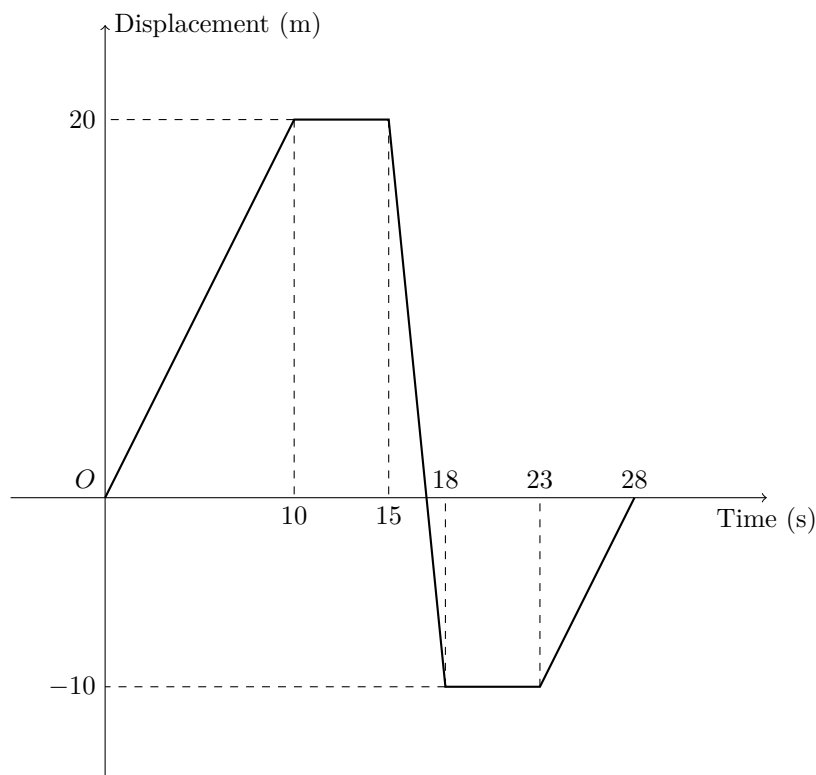
(3) What fraction does the lowest share get? $\frac{2}{2+3+4} = \frac{2}{9}$.

Problem 2.2. Money is shared in ratio 1 : 5. If the smaller share is £40, what is the total share?

Solution. $£40 \div 1 \times (1 + 5) = £240$.

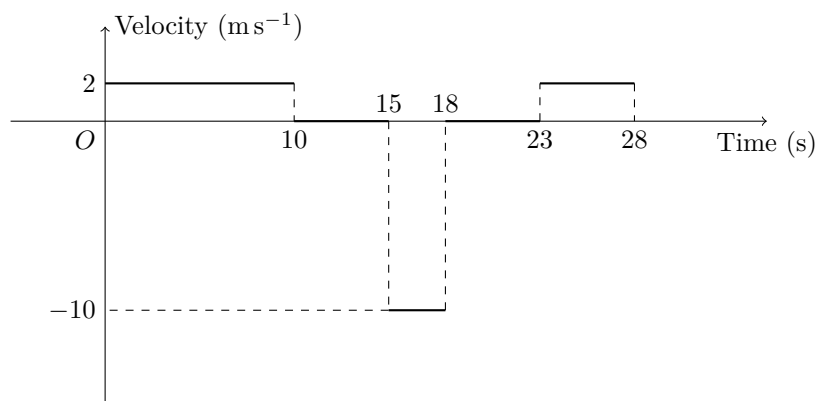
Section 3 Graphs

Example 3.1. (Displacement-Time Graph) Describe the movement of the object.



Time	Direction	Velocity
0 – 10	Positive	20 m s^{-1}
10 – 15	At Rest	0
15 – 18	Negative	-10 m s^{-1}
18 – 23	At Rest	0
23 – 28	Positive	2 m s^{-1}

Example 3.2. (Velocity-Time Graph) Draw the Velocity-Time Graph of this motion.



Definition 3.3. (Average Velocity, Average Speed)

$$\text{Average Velocity} = \frac{\text{Total Displacement}}{\text{Total Time}},$$

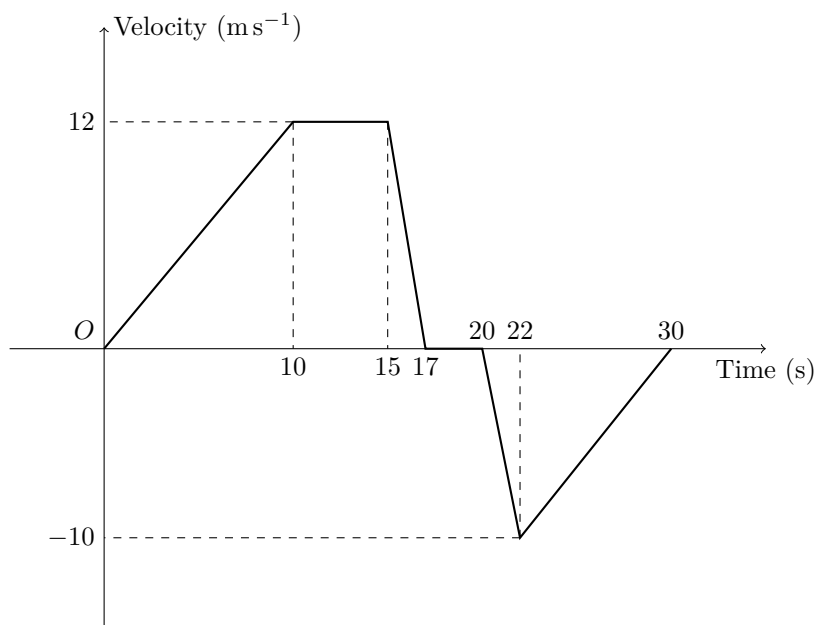
$$\text{Average Speed} = \frac{\text{Total Distance}}{\text{Total Time}}.$$

Example 3.4. (Average Velocity, Average Speed) Calculate the Average Velocity and Average Speed of the previous example.

$$\text{Average Velocity} = \frac{\text{Total Displacement}}{\text{Total Time}} = \frac{0 \text{ m}}{28 \text{ s}} = 0,$$

$$\text{Average Speed} = \frac{\text{Total Distance}}{\text{Total Time}} = \frac{60 \text{ m}}{28 \text{ s}} = 2.14 \text{ m s}^{-1}.$$

Example 3.5. (Velocity-Time Graph) Describe the movement of the object.



Time	Direction of Movement	Velocity	Direction of Acceleration	Acceleration
0 – 10	Positive	N/A	Positive	1.2 m s^{-2}
10 – 15	Positive	12 m s^{-1}	Zero	0
15 – 17	Positive	N/A	Negative	-6 m s^{-2}
17 – 20	At Rest	0	Zero	0
20 – 22	Negative	N/A	Negative	-5 m s^{-2}
22 – 30	Negative	N/A	Positive	1.25 m s^{-2}

Method 3.6. (Calculating Displacement/Distance via a Velocity/Speed Graph)

$$S = \int dS$$

$$= \int v dt,$$

therefore the Displacement/Distance is the area below the Velocity/Speed curve.

Example 3.7. (Calculating Displacement/Distance via a Velocity/Speed Graph) Calculate the displacement and the distance of the previous example.

$$\begin{aligned} \text{Displacement} &= 10 \text{ s} \times 12 \text{ m s}^{-1} \times \frac{1}{2} + 5 \text{ s} \times 12 \text{ m s}^{-1} + 2 \text{ s} \times 12 \text{ m s}^{-1} \times \frac{1}{2} \\ &\quad + 2 \text{ s} \times -10 \text{ m s}^{-1} \times \frac{1}{2} + 8 \text{ s} \times -10 \text{ m s}^{-1} \times \frac{1}{2} \\ &= 82 \text{ m}. \end{aligned}$$

$$\begin{aligned}\text{Distance} &= 10\text{ s} \times 12\text{ m s}^{-1} \times \frac{1}{2} + 5\text{ s} \times 12\text{ m s}^{-1} + 2\text{ s} \times 12\text{ m s}^{-1} \times \frac{1}{2} \\ &\quad + 2\text{ s} \times 10\text{ m s}^{-1} \times \frac{1}{2} + 8\text{ s} \times 10\text{ m s}^{-1} \times \frac{1}{2} \\ &= 182\text{ m}.\end{aligned}$$

Example 3.8. (Calculating Average Velocity/Speed)

$$\text{Average Velocity} = \frac{\text{Total Displacement}}{\text{Total Time}} = \frac{82\text{ m}}{30\text{ s}},$$

$$\text{Average Speed} = \frac{\text{Total Distance}}{\text{Total Time}} = \frac{182\text{ m}}{30\text{ s}}.$$