Test 1

Total: / 35 marks   ANSWERS

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Problem 1   *[12 marks]*

A football coach paces back and forth along the side-lines. The diagram below shows several of the coach's positions at various times. At each marked position, the coach makes a "U-turn" and moves in the opposite direction.

Un entrenador de fútbol camina de un lado a otro por la banda. El siguiente diagrama muestra varias de las posiciones del entrenador en distintos momentos. En cada posición marcada, el entrenador hace un "giro en U" y se mueve en la dirección opuesta.

フットボールのコーチがサイドラインに沿って行ったり来たりしている。下の図は、さまざまな時点でのコーチのポジションのいくつかを示しています。マークされた各位置で、コーチは「U ターン」を行い、反対方向に移動します。
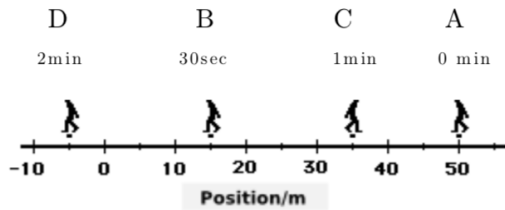
1) The coach's resulting displacement is

$$\Delta \vec{S} = \vec{S}_D - \vec{S}_A = -5 - 50 = \boxed{-55m} \quad \text{(55 m.left)}$$

2) What is his total distance of travel is

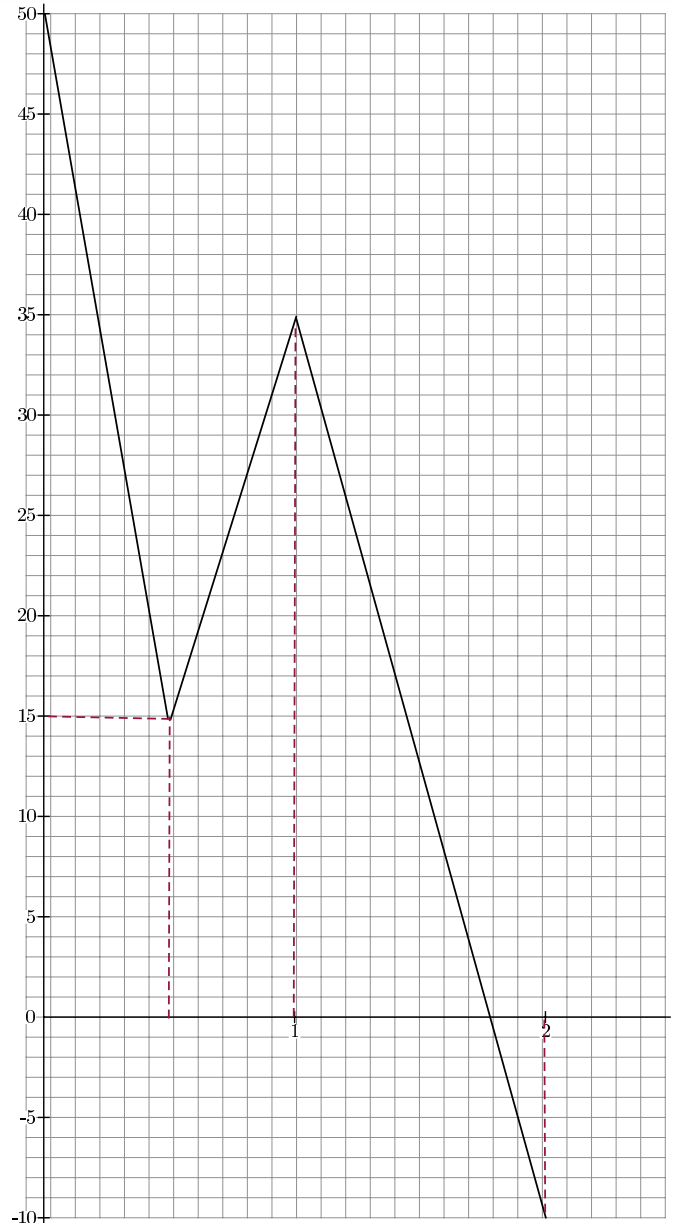$$d_{\text{tot}} = d_{\text{AB}} + d_{\text{BC}} + d_{\text{CD}} = 35 + 20 + 40 = \boxed{95m}$$

3) What is his average speed is

$$V_A = \frac{d_{\text{tot}}}{\Delta t} = \frac{95}{120} = \boxed{\frac{19}{24}\text{ms}^{-1}} \quad (\cong 0.79 \text{ ms}^{-1})$$

4) Its his average velocity is :

$$\vec{V}_A = \frac{\Delta \vec{S}}{\Delta t} = -\frac{55m}{120s} = \boxed{-\frac{11}{24}\text{ms}^{-1}} (\cong 0.46 \text{ ms}^{-1})$$
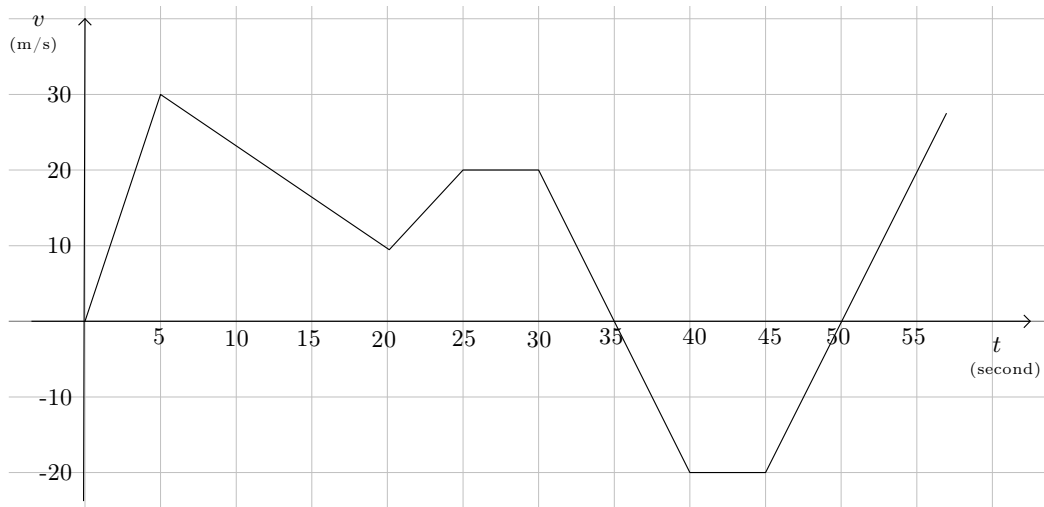
5) The graph for the position of the coach versus time is on the right side of this page.

Question 2 *[9 marks]*

The following graphics shows the **velocity** of a bicycle walking on a road for t between 0 and 55s


[Hint : *For the question 2 you will have to convert unit km/h in an other unit !*]

1) What is the *velocity* of the bike at $t = 20 \sec$?　　$\boxed{10 \text{ m/s}}$

2) Estimate when, for the third time the velocity of the bike reaches 90km/h ?　$\boxed{t \cong 57s}$

3) What is the *displacement* of the bicycle for $0 \leqslant t \leqslant 30\,s$?　　$\boxed{75 + 300 + 75 + 100 = 550\text{m}}$

5) What is the *average velocity* of the bike for $0 \leqslant 1 \leqslant 45\,s$?　$\boxed{V_A = \frac{550 + 50 - 50 - 100}{45} = 10\text{m/s}}$

Question 3 *[8 marks]*

The position of a skate is given by the graphics below
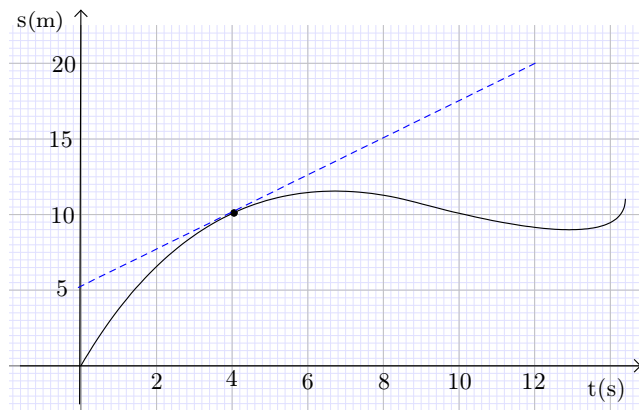
1) The *position* of the skate at $t = 4s$ is $\boxed{10m}$

2) The *average velocity* between $t = 0$ and $t = 10 \sec$ is $\frac{\Delta s}{\Delta t} = \frac{10 - 0}{10 - 0} = \boxed{1\frac{m}{s}}$

3) The *velocity* at $t = 4\sec$ is given by the *gradient* of the tangent to the curve at $t = 4$

That is $\frac{20 - 5}{12} = \boxed{1.25\frac{m}{s}}$

4) The *sign of the speed* at $t = 10\,s$ is $\boxed{+}$, even if the *velocity* at $t = 10\,s$ is *negative*!

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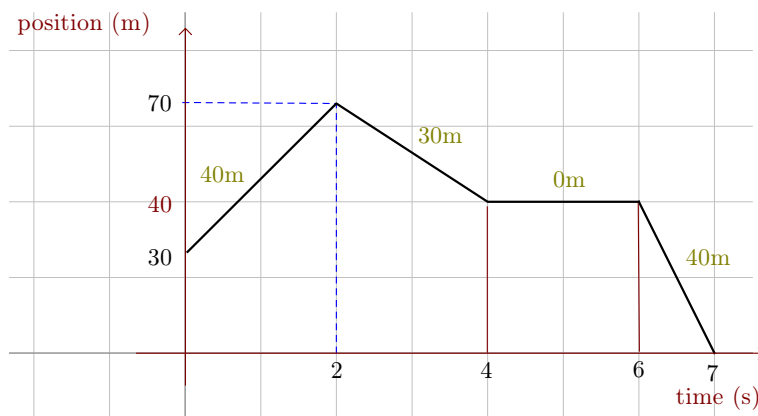**Question 4**   *[2 marks]*

An athlete runs round a circular track at constant speed. Which **one** of the following graphs best represents the variation with time t of the magnitude d of the **displacement** of the athlete from the starting position during one lap of the track?

A.

B.

C.

D.
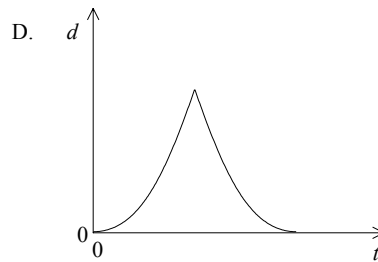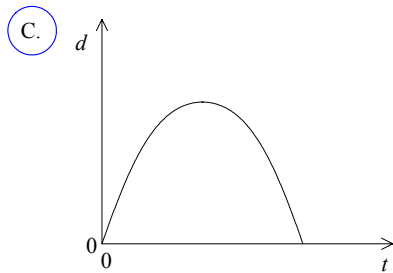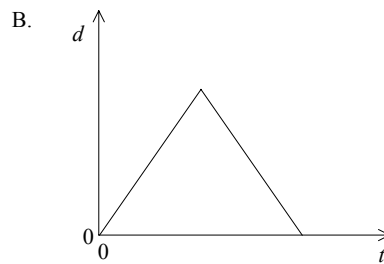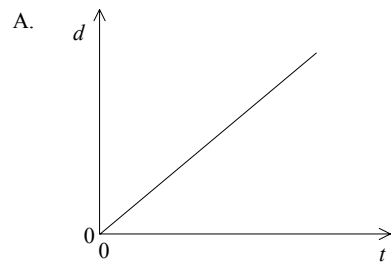
Question 5   *[4 marks]*

Calculate the *average speed* of the object between 0 and 7s

$$\text{average speed} = \frac{\text{distance moved}}{\text{total time}} = \frac{40 + 30 + 0 + 40}{7} = \boxed{15.7 \frac{m}{s}}$$