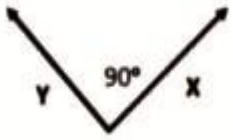
Model questions (moe.eg)

1. The opposite figure shows two equal vectors $\vec{X}$ *and* $\vec{Y}$, inclined on each other by an angle of 90°. Which one of the following mathematical relations gives a result equal to zero?



- Their sum. $(\vec{X}+\vec{Y})$
- Their subtraction. $(\vec{X}-\vec{Y})$
- Their dot product. $(\vec{X}\cdot\vec{Y})$
- Their cross product. $(\vec{X}\wedge\vec{Y})$

2. If the dimensional formula of the physical quantities ($M^X L^Y T^Z$) is applied on the dimensional formula of the force, what will be the value of (X+Y+Z).

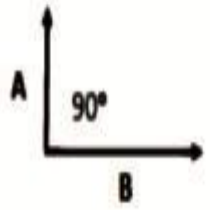
$$F = m \times a \rightarrow MLT^{-2}$$

$$X = 1 \ , \ Y = 1 \ , \ Z = -2$$

$$X + Y + Z = 1 + 1 + (-2) = 0$$

3. The figure shows two vectors, where A=3 and B=4. Find

- Their cross product.
- Their dot product.
- Their resultant vector.



$$A \wedge B = AB\sin\theta = 3\times 4\sin 90 = 12\,\vec{n}$$

$$A.B = AB\cos\theta = 3\times 4\cos 90 = 0$$

$$\Sigma\, AB = \sqrt{A^2 + B^2} = \sqrt{3^2 + 4^2} = \sqrt{25} = 5$$

4. Someone suggested that the energy of a car (E) depends on its mass and its velocity, so he wrote the relation as : E = m x V.

- Use the dimensional formula to verify if the relation is correct.

L.h.s.		*R.h.s.*
J		$M \times LT^{-1}$
ML^2T^{-2}	$\neq$	MLT^{-1}

Incorrect relation

5. Mazen was jogging so he walked with a uniform velocity of 1 m/s for 10 minutes then run with a velocity of 4 m/s for 5 minutes. Find the average velocity of Mazen during 15 minutes.

$$d_1 = V_1 \times t_1 = 1 \times 10 \times 60 = 600\,m$$

$$d_2 = V_2 \times t_2 = 4 \times 5 \times 60 = 1200\,m$$

$$\vec{V} = \frac{t.d}{t.t} = \frac{600 + 1200}{(10+5) \times 60} = \frac{1800}{900} = 2\,m/s$$

OR

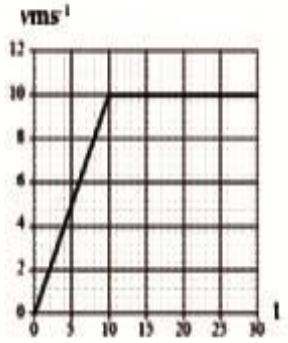
$$\vec{V} = \frac{V_1 + V_1 + V_2}{3} = \frac{1+1+4}{3} = 2\,m/s$$

6. The positions of two cars at successive periods of times each of 1 second were expressed as in the following figure, where both cars are moving to the right.

Which of the following sentences describes correctly the motion of both cars?

- Both move with a non uniform velocity.
- Car X moves with a uniform velocity while car Y moves with a uniform acceleration.
- Car X moves with a non-uniform acceleration while car Y moves with a uniform velocity.
- Car X moves with a uniform acceleration while car Y moves with a uniform velocity.

7. A car was moving in a straight racing track, the graph represents the variation of its velocity (V) with time (t). Knowing that after 25 sec. the car had cover 200 m. Which of the following statements is correct at the 25th second?



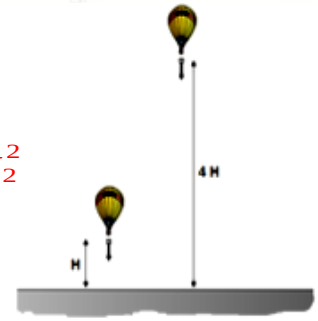
average velocity	instantaneous velocity	
8 m s^{-1}	8 m s^{-1}	A
10 m s^{-1}	8 m s^{-1}	B
8 m s^{-1}	10 m s^{-1}	C
10 m s^{-1}	10 m s^{-1}	D

8. A parachutist whose mass is 80 kg falls vertically with a uniform velocity of 50 m/s, then the vertical force affecting him upwards is equal to ..... F_g (Weight)

$$\sum F = 0$$

9. A box was allowed to fall from a balloon twice. The first time from a height = H and the second time from a height = 4H. The time taken by the box to fall to the ground at the second time compared to that of the first time ……

- Equal as it doesn't depend on the height.
- Two times
- Three times
- Four times



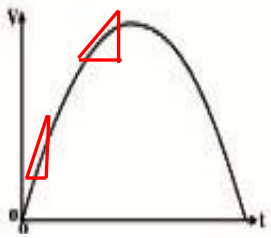
$$H = \frac{1}{2} g t_1^2 \quad , \quad 4H = \frac{1}{2} g t_2^2$$

$$t_1^2 = \frac{2H}{g} \quad , \quad t_2^2 = \frac{8H}{g}$$

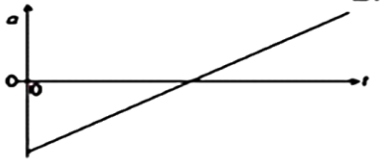
$$\frac{t_2^2}{t_1^2} = \frac{\frac{8H}{g}}{\frac{2H}{g}} = \frac{4}{1} \quad , \quad \frac{t_2}{t_1} = \frac{2}{1}$$

$$t_2 = 2t_1$$

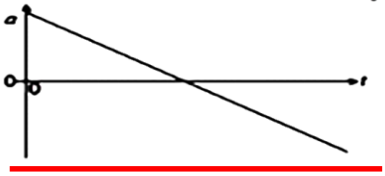
10. The opposite graph shows the change in the velocity (V) of a body moving in straight line with time (t). Which of the following graphs, shows the variation of the acceleration (a) of that body with the time (t).



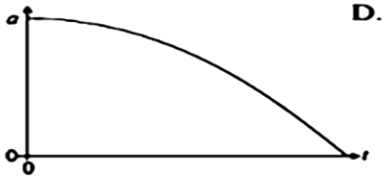
B.



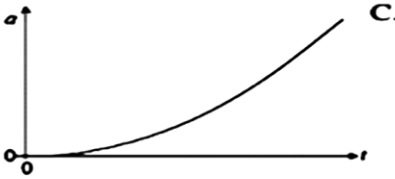
A.



D.



C.



11. A body is falling freely. If the velocity of that body became (V) after a time (t), what will be its velocity after a time (2t) from the instant of fall?

$V_f = V_i + gt \quad , \quad V_f = gt$

$\frac{V_{f_1}}{V_{f2}} = \frac{gt_1}{gt_2} \quad , \quad \frac{V}{V_{f2}} = \frac{t}{2t}$

$V_{f2} = 2V$

OR

$V_f = V_i + gt \quad , \quad V_f = gt$

$g\ is\ cons\tan t\ , \ \therefore V_f\ \alpha\ t$

$V_{f2} = 2V$

12. Ahmed and Fadi were standing on a rocky cliff overlooking a lake. Ahmed threw a basket ball vertically upwards, at the same instant Fadi threw another one vertically downwards with the same initial velocity. Which ball will hit the water surface with a higher velocity?

- Ahmed's ball.
- Fadi's ball.
- Both balls hit water with the same velocity.
- The information are not enough to answer.