2015 **9** A particle is moving along the *x*-axis. The graph shows its velocity *v* metres per second at time *t* seconds.
When *t* = 0 the displacement *x* is equal to 2 metres.
What is the maximum value of the displacement *x*?

1

(A) 8 m   (B) 14 m

(C) 16 m   (D) 18 m
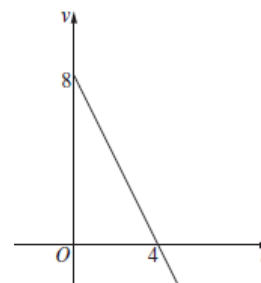
D

Maximum displacement when *v* = 0.

Distance travelled = area of triangle

$$= \frac{1}{2} \times 4 \times 8$$

$$= 16$$

Displacement = 2 + 16

$$= 18$$

∴ the maximum value of *x* is 18 m.

Alternative method:

The graph has gradient of −2 and *v*-intercept of 8.

∴ $v = -2t + 8$.

Now, $x = -t^2 + 8t + c$

Subs $t = 0$, $x = 2$:

$$2 = -(0)^2 + 8(0) + c$$

∴ $c = 2$

$$x = -t^2 + 8t + 2$$

Subs $t = 4$:

$$x = -(4)^2 + 8(4) + 2$$

$$= 18$$

∴ the displacement is 18 m.

State Mean:
0.31