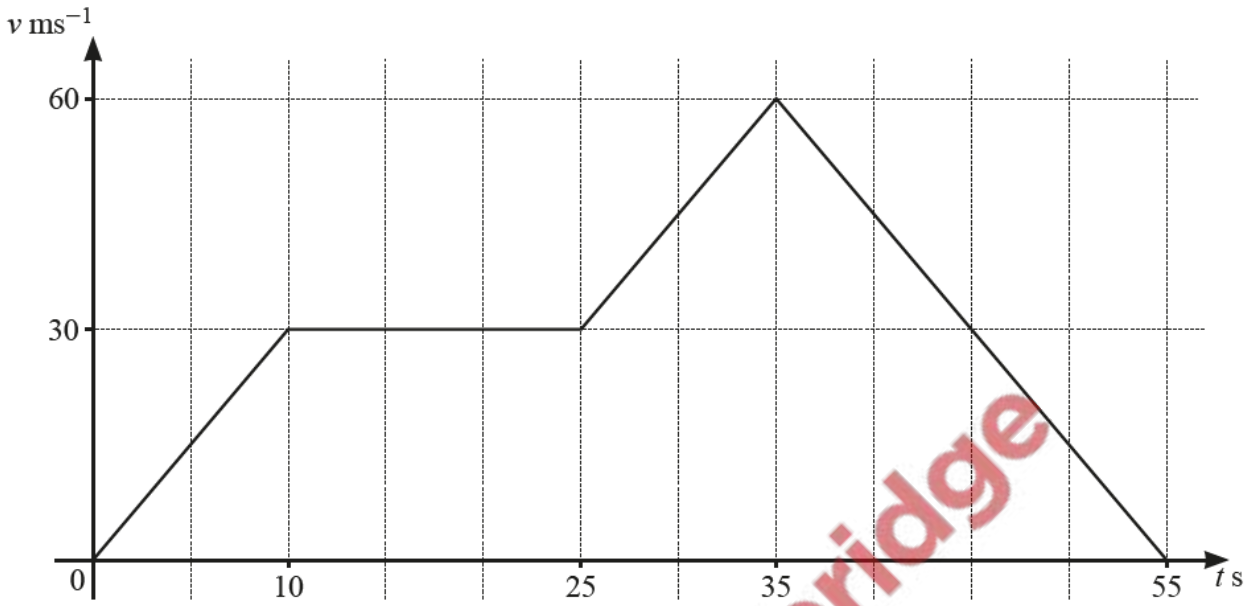
Straight line graphs – 2021 O Level Additional Math

1. Nov/2021/Paper_12/No.11

(a)



The diagram shows the velocity–time graph for a particle P, travelling in a straight line with velocity $v\,\text{ms}^{-1}$ at a time t seconds. P accelerates at a constant rate for the first 10 s of its motion, and then travels at constant velocity, $30\,\text{ms}^{-1}$, for another 15 s. P then accelerates at a constant rate for a further 10 s and reaches a velocity of $60\,\text{ms}^{-1}$. P then decelerates at a constant rate and comes to rest when $t = 55$.

(i) Find the acceleration when $t = 12$. [1]

(ii) Find the acceleration when $t = 50$. [1]

(iii) Find the total distance travelled by the particle P. [2]

(b) A particle Q travels in a straight line such that its velocity, $v\,\text{ms}^{-1}$, at time ts after passing through a fixed point O is given by $v = 4\cos 3t - 4$.

(i) Find the speed of Q when $t = \frac{5\pi}{9}$. [2]

(ii) Find the smallest positive value of t for which the acceleration of Q is zero. [3]

(iii) Find an expression for the displacement of Q from O at time t. [2]

2. Nov/2021/Paper_13/No.9

When e^{2y} is plotted against x^2, a straight line graph passing through the points (4, 7.96) and (2, 3.76) is obtained.

(a) Find y in terms of x. [5]

(b) Find y when $x = 1$. [2]

(c) Using your equation from **part (a)**, find the positive values of x for which the straight line exists. [3]

3. Nov/2021/Paper_22/No.8

Variables x and y are such that when $\sqrt{y}$ is plotted against $\log_2(x+1)$, where $x > -1$, a straight line is obtained which passes through $(2, 10.4)$ and $(4, 15.4)$.

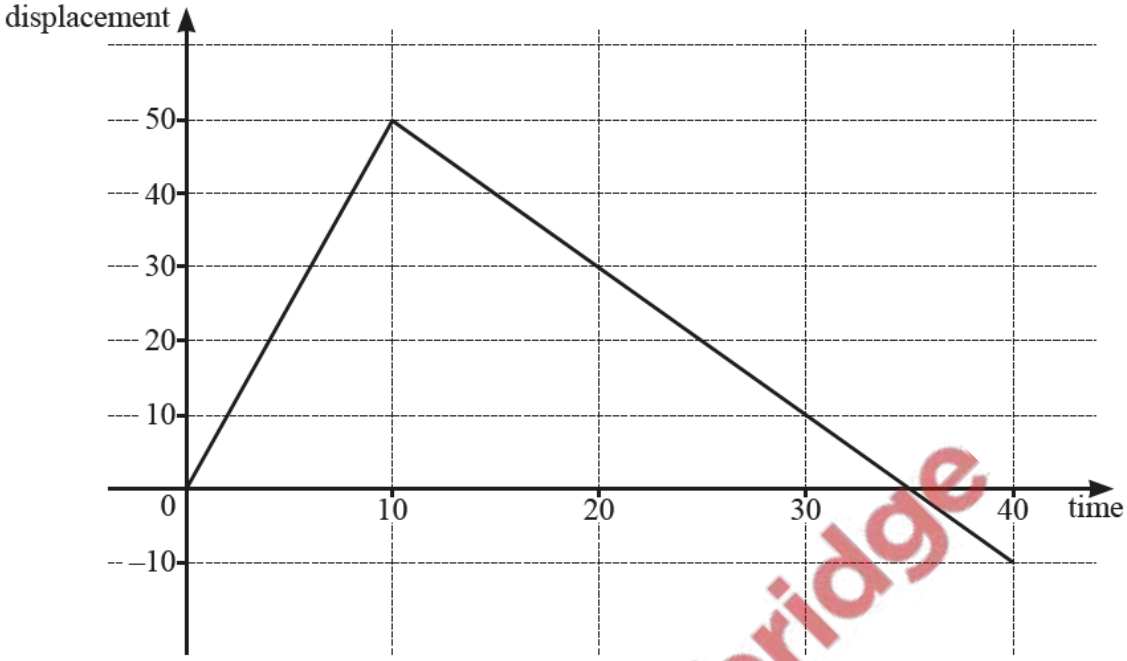
(a) Find $\sqrt{y}$ in terms of $\log_2(x+1)$. [4]

(b) Find the value of y when $x = 15$. [1]

(c) Find the value of x when $y = 25$. [3]

4. June/2021/Paper_11/No.7

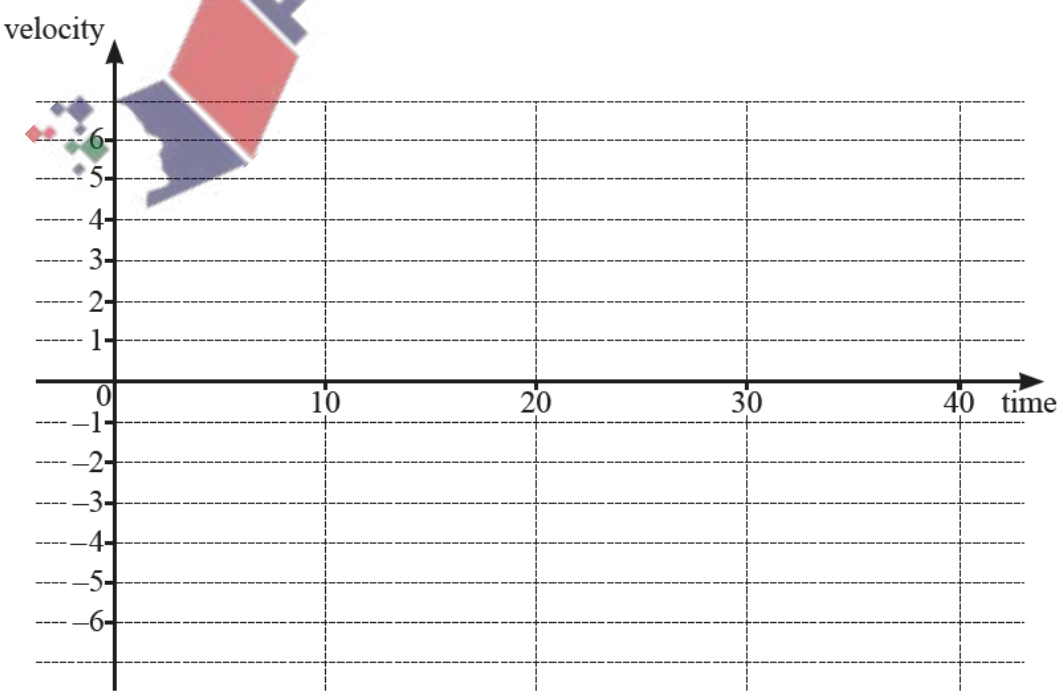
(a) In this question, all lengths are in metres and time, t, is in seconds.



The diagram shows the displacement–time graph for a runner, for $0 \leqslant t \leqslant 40$.

(i) Find the distance the runner has travelled when $t = 40$. [1]

(ii) On the axes, draw the corresponding velocity–time graph for the runner, for $0 \leqslant t \leqslant 40$. [2]



(b) A particle, P, moves in a straight line such that its displacement from a fixed point at time t is s.

The acceleration of P is given by $(2t+4)^{-\frac{1}{2}}$, for $t > 0$.

(i) Given that P has a velocity of 9 when $t = 6$, find the velocity of P at time t. [3]

(ii) Given that $s = \frac{1}{3}$ when $t = 6$, find the displacement of P at time t. [3]

5. June/2021/Paper_21/No.5

The curves $y = x^2$ and $y^2 = 27x$ intersect at $O(0, 0)$ and at the point A. Find the equation of the perpendicular bisector of the line OA. [8]