6. Find the point of intersection of each of the following sets of planes.

(iii) $x + y + z = 2$ ①

$2x + 3y + z = 7$ ②

$\dfrac{x}{2} - \dfrac{y}{6} + \dfrac{z}{3} = \dfrac{2}{3}$ ③

Eliminate ys 6 ③
                      $+$ ①

$3x - y + 2z = 4$
$\underline{x + y + z = 2}$
$4x \quad + 3z = 6$ ④

          ②
      -3 ①

$2x + 3y + z = 7$
$\underline{-3x - 3y - 3z = -6}$
$-x \quad - 2z = +1$ ⑤

Solve ④ & ⑤
Eliminate xs   ④
                  $+4$ ⑤

$4x + 3z = 6$
$\underline{-4x - 8z = 4}$
$-5z = 10$ $\Rightarrow$ $z = -2$

Sub $z = -2$ into ⑤
                  -4

$-x - 2(-2) = 1$
$-x + 4 = 1$
$-x = -3$ $\Rightarrow$ $x = 3$

Sub $x = 3, z = -2$ into ①

$3 + y - 2 = 2$
$y + 1 = 2$ $\Rightarrow$ $y = 1$

Intersection point $(3, 1, -2)$

[15 marks]
7 minutes

(b) Solve the simultaneous equations;

$x + y + z = 16$ ①

$\dfrac{5}{2}x + y + 10z = 40$ ②

$2x + \dfrac{1}{2}y + 4z = 21.$ ③

Eliminate ys

          2 ②
        -2 ①

$5x + 2y + 20z = 80$
$\underline{-2x - 2y - 2z = -32}$
$3x \quad + 18z = 48$ ④

          2 ③
          $-$ ①

$4x + y + 8z = 42$
$\underline{-x - y - z = -16}$
$3x \quad + 7z = 26$ ⑤

Solve ④ and ⑤
eliminate xs   ④
                     $-$ ⑤

$3x + 18z = 48$
$\underline{-3x - 7z = -26}$
$11z = 22$ $\Rightarrow$ $z = 2$

Sub $z = 2$ into ⑤

$3x + 7(2) = 26$
$3x + 14 = 26$
$3x = 12$ $\Rightarrow$ $x = 4$

Sub $x = 4$ and $z = 2$
into ①

$4 + y + 2 = 16$
$y + 6 = 16$ $\Rightarrow$ $y = 10$