SOLUTIONS:

Division Point of a Line Segment

1) Determine the coordinate of *Point D* that divides line segment $\overline{AB}$ in a ratio 1:3 from *Point A* $(-4, 8)$ to *Point B* $(12, -32)$

$x_D = x_1 + \left(\frac{a}{a+b}\right)(\Delta x)$

$x_D = (-4) + \left(\frac{1}{4}\right)(16)$
$x_D = (-4) + \left(\frac{1}{4}\right)\left(\frac{16}{1}\right)$
$x_D = (-4) + \left(\frac{16}{4}\right)$
$x_D = (-4) + (4)$
$x_D = 0$

$y_D = y_1 + \left(\frac{a}{a+b}\right)(\Delta y)$

$y_D = (8) + \left(\frac{1}{4}\right)(40)$
$y_D = (8) + \left(\frac{1}{4}\right)\left(\frac{40}{1}\right)$
$y_D = (8) + \left(\frac{40}{4}\right)$
$y_D = (8) + (10)$
$y_D = 18$

Workshop

$A(-4, 8)$ $B(12, -32)$

$a = 1$
$b = 3$
$a + b = 4$

$x_1 = -4$
$y_1 = 8$

$\Delta x = x_2 - x_1$
$\Delta x = (12) - (-4)$
$\Delta x = 12 + 4$
$\Delta x = 16$

$\Delta y = y_2 - y_1$
$\Delta y = (8) - (-32)$
$\Delta y = 8 + 32$
$\Delta y = 40$

Point D $(0, 18)$

2) Determine the coordinate of *Point D* that divides line segment $\overline{EF}$ in a ratio 1:3 from *Point E* $(-16, 12)$ to *Point F* $(32, -48)$

$x_D = x_1 + \left(\frac{a}{a+b}\right)(\Delta x)$

$x_D = (-16) + \left(\frac{1}{4}\right)(48)$
$x_D = (-16) + \left(\frac{1}{4}\right)\left(\frac{48}{1}\right)$
$x_D = (-16) + \left(\frac{48}{4}\right)$
$x_D = (-16) + (12)$
$x_D = -4$

$y_D = y_1 + \left(\frac{a}{a+b}\right)(\Delta y)$

$y_D = (12) + \left(\frac{1}{4}\right)(60)$
$y_D = (12) + \left(\frac{1}{4}\right)\left(\frac{60}{1}\right)$
$y_D = (12) + \left(\frac{60}{4}\right)$
$y_D = (12) + (15)$
$y_D = 27$

Workshop

$E(-16, 12)$ $F(32, -48)$

$a = 1$
$b = 3$
$a + b = 4$

$x_1 = -16$
$y_1 = 12$

$\Delta x = x_2 - x_1$
$\Delta x = (32) - (-16)$
$\Delta x = 32 + 16$
$\Delta x = 48$

$\Delta y = y_2 - y_1$
$\Delta y = (-48) - (12)$
$\Delta y = -48 - 12$
$\Delta y = 60$

Point D $(-4, 27)$

3) Determine the coordinate of *Point D* that divides line segment $\overline{GH}$ two thirds of the way from *Point* $G(-7, 15)$ to *Point* $H(2, -6)$

$x_D = x_1 + \left(\frac{a}{a+b}\right)(\Delta x)$

$x_D = (-7) + \left(\frac{2}{3}\right)(9)$
$x_D = (-7) + \left(\frac{2}{3}\right)\left(\frac{9}{1}\right)$
$x_D = (-7) + \left(\frac{9}{3}\right)$
$x_D = (-7) + (3)$
$x_D = -4$

$y_D = y_1 + \left(\frac{a}{a+b}\right)(\Delta y)$

$y_D = (-12) + \left(\frac{2}{3}\right)(-21)$
$y_D = (-12) + \left(\frac{2}{3}\right)\left(\frac{-21}{1}\right)$
$y_D = (-12) + \left(\frac{-42}{3}\right)$
$y_D = (-21) + (-14)$
$y_D = 27$

Workshop

$G(-7, 15)$ $H(2, -6)$

$a = 2$
$b = 1$
$a + b = 3$

$\Delta x = x_2 - x_1$
$\Delta x = (2) - (-7)$
$\Delta x = 2 + 7$
$\Delta x = 9$

$x_1 = -7$
$y_1 = 15$

$\Delta y = y_2 - y_1$
$\Delta y = (-6) - (15)$
$\Delta y = -6 - 15$
$\Delta y = -21$

Point D $(-4, 27)$

4) Determine the coordinate of *Point D* that divides line segment $\overline{IJ}$ in a ratio 2:3 from *Point* $J(-7, 16)$ to *Point* $I(3, -4)$

$x_D = x_1 + \left(\frac{a}{a+b}\right)(\Delta x)$

$x_D = (3) + \left(\frac{2}{5}\right)(-10)$
$x_D = (3) + \left(\frac{2}{5}\right)\left(\frac{-10}{1}\right)$
$x_D = (3) + \left(\frac{-10}{5}\right)$
$x_D = (3) + (-2)$
$x_D = 1$

$y_D = y_1 + \left(\frac{a}{a+b}\right)(\Delta y)$

$y_D = (-4) + \left(\frac{2}{5}\right)(20)$
$y_D = (-4) + \left(\frac{2}{5}\right)\left(\frac{20}{1}\right)$
$y_D = (-4) + \left(\frac{40}{5}\right)$
$y_D = (-4) + (8)$
$y_D = 4$

Workshop

$I(3, -4)$ $J(-7, 16)$

$a = 2$
$b = 3$
$a + b = 5$

$\Delta x = x_2 - x_1$
$\Delta x = (-7) - (3)$
$\Delta x = -7 - 3$
$\Delta x = -10$

$x_1 = 3$
$y_1 = -4$

$\Delta y = y_2 - y_1$
$\Delta y = (16) - (-4)$
$\Delta y = 16 + 4$
$\Delta y = 20$

Point D $(1, 4)$

5) Determine the coordinate of *Point D* that divides line segment $\overline{KL}$ $\frac{2}{7}$ from *Point* $K(14,49)$ to *Point* $L(35,77)$

$x_D = x_1 + \left(\frac{a}{a+b}\right)(\Delta x)$

$x_D = (14) + \left(\frac{2}{7}\right)(21)$
$x_D = (14) + \left(\frac{2}{7}\right)\left(\frac{21}{1}\right)$
$x_D = (14) + \left(\frac{42}{7}\right)$
$x_D = (14) + (6)$
$x_D = 20$

$y_D = y_1 + \left(\frac{a}{a+b}\right)(\Delta y)$

$y_D = (49) + \left(\frac{2}{7}\right)(28)$
$y_D = (49) + \left(\frac{2}{7}\right)\left(\frac{28}{1}\right)$
$y_D = (49) + \left(\frac{56}{7}\right)$
$y_D = (49) + (8)$
57

Workshop

$K\ (14,\ 49)$ $L(35,\ 77)$

$a = 2$
$b = 5$
$a + b = 7$

$\Delta x = x_2 - x_1$
$\Delta x = (35) - (14)$
$\Delta x = 35 - 14$
$\Delta x = 21$

$x_1 = 14$
$y_1 = 49$

$\Delta y = y_2 - y_1$
$\Delta y = (77) - (49)$
$\Delta y = 77 - 49$
$\Delta y = 28$

Point D $(20, 57)$

6) Determine the coordinate of *Point D* that divides line segment $\overline{PQ}$ a quarter of the way from *Point* $Q\ (-1,\ 3)$ to *Point* $P(53,-17)$

$x_D = x_1 + \left(\frac{a}{a+b}\right)(\Delta x)$

$x_D = (-1) + \left(\frac{1}{5}\right)(54)$
$x_D = (-1) + \left(\frac{1}{5}\right)\left(\frac{54}{1}\right)$
$x_D = (-1) + \left(\frac{54}{5}\right)$
$x_D = (-1) + (10.8)$
$x_D = 9.8$

$y_D = y_1 + \left(\frac{a}{a+b}\right)(\Delta y)$

$y_D = (3) + \left(\frac{1}{5}\right)(-20)$
$y_D = (3) + \left(\frac{1}{5}\right)\left(\frac{-20}{1}\right)$
$y_D = (3) + \left(\frac{-20}{5}\right)$
$y_D = (3) + (-4)$
$y_D = -1$

Workshop

$Q\ (-1, 3)$ $P(53,-17)$

$a = 1$
$b = 4$
$a + b = 5$

$\Delta x = x_2 - x_1$
$\Delta x = (53) - (-1)$
$\Delta x = 53 + 1$
$\Delta x = 54$

$x_1 = -1$
$y_1 = 3$

$\Delta y = y_2 - y_1$
$\Delta y = (-17) - (3)$
$\Delta y = -17 - 3$
$\Delta y = -20$

Point D $(9.8,\ -1)$

7) Determine the coordinate of *Point D* that divides line segment $\overline{RS}$ in a ratio 3 : 5 from *Point R* (– 77, – 24) to *Point S*(11, 48)

$x_D = x_1 + \left(\frac{a}{a+b}\right)(\Delta x)$

$x_D = (-77) + \left(\frac{3}{8}\right)(88)$

$x_D = (-77) + \left(\frac{3}{8}\right)\left(\frac{88}{1}\right)$

$x_D = (-77) + \left(\frac{264}{8}\right)$

$x_D = (-77) + (33)$

$x_D = -44$

$y_D = y_1 + \left(\frac{a}{a+b}\right)(\Delta y)$

$y_D = (-24) + \left(\frac{3}{8}\right)(72)$

$y_D = (-24) + \left(\frac{3}{8}\right)\left(\frac{72}{1}\right)$

$y_D = (-24) + \left(\frac{216}{8}\right)$

$y_D = (-24) + (27)$

$y_D = 3$

Workshop

R (– 77, – 24) *S*(11, 48)

$a = 3$

$b = 5$

$a + b = 8$

$x_1 = -77$

$y_1 = -24$

$\Delta x = x_2 - x_1$

$\Delta x = (11) - (-77)$

$\Delta x = 11 + 77$

$\Delta x = 88$

$\Delta y = y_2 - y_1$

$\Delta y = (48) - (-24)$

$\Delta y = 48 + 24$

$\Delta y = 72$

Point D (– 44, 3)