CHAPTER 5: THE STRAIGHT LINE

Paper 2

Solution to Question 10

(a) Given y-intercept of ABC is 2.
Therefore, $OB = 2$ units

y-coordinate of $C = 5$
Therefore, $OD = 5$ units

Thus, x-coordinate of $C = h$
Then,
$$\begin{aligned} h &= DC \\ &= DB \\ &= OD - OB \\ &= 5 - 2 \\ &= 3 \end{aligned}$$

(b) The straight line ABC passes through points $B(0, 2)$ and $C(3, 5)$.

Therefore, gradient of $ABC = \dfrac{5-2}{3-0}$
$= 1$

Thus, the equation of the straight line ABC is $y = x + 2$.

(c) A is the point of intersection of the straight lines
$y = x + 2$ ... (1)
and $y = \dfrac{1}{2}x - 3$ ... (2)

Substitute (1) into (2):
$$\begin{aligned} x + 2 &= \frac{1}{2}x - 3 \\ x - \frac{1}{2}x &= -3 - 2 \\ \frac{1}{2}x &= -5 \\ x &= -10 \end{aligned}$$

Substitute $x = -10$ into (1): $y = -10 + 2$
$= -8$

Thus, the coordinates of A are $(-10, -8)$.

Solution to Question 12

(a) $$OP = \sqrt{(3-0)^2 - (4-0)^2}$$
$$= \sqrt{9+16}$$
$$= \sqrt{25}$$
$$= 5 \text{ units}$$

Given $PT = OP$
Therefore, $PT = 5$ units

x-coordinate of $P = 3$
Therefore, $RP = 3$ units

$TR = PT - RP$
$= 5 - 3$
$= 2$ units

x-coordinate of $T = -2$

PT // x-axis means y-coordinate of T = y-coordinate of $P = 4$

Thus, coordinates of $T = (-2, 4)$

(b) $$\text{Gradient of } TQ = \frac{4-(-1)}{-2-(-7)}$$
$$= \frac{5}{5}$$
$$= 1$$

The straight line TQ passes through point $T(-2, 4)$. Therefore, substitute $x = -2$, $y = 4$ and $m = 1$ into $y = mx + c$.

$4 = 1(-2) + c$
$c = 6$

Thus, the equation of TQ is $y = x + 6$.

Solution to Question 15

(a) Equation of KL: $y = 8 - 4x$

When $x = 0$, $y = 8 - 4(0) = 8$ meaning $OK = 8$ units

When $y = 0$,
$$0 = 8 - 4x$$
$$4x = 8$$
$$x = 2$$ meaning $OL = 2$ units

$OM = OL + LM = 2 + 4 = 6$ units

Therefore, for the straight line KM, y-intercept = 8 and x-intercept = 6.

Hence, gradient of KM
$$= -\frac{8}{6}$$
$$= -\frac{4}{3}$$

Thus, the equation of KM is $y = -\frac{4}{3}x + 8$.

(b) Using Pythagoras' theorem on ΔKOM,

$$KM^2 = 8^2 + 6^2$$
$$= 100$$
$$KM = \sqrt{100}$$
$$= 10 \text{ units}$$