Ex 2.4

(1)
$$x, \quad x+1 \quad \text{are consecutive No's}$$

$$(x)^2 + (x+1)^2 = 61$$
$$x^2 + x^2 + 2x + 1 = 61$$
$$2x^2 + 2x - 60 = 0$$
$$x^2 + x - 30 = 0$$
$$(x - 5)(x + 6) = 0$$
$$x = 5 \qquad x = -6$$

The 2 No's are $5 \, \& \, 6$ or $-6, -5$

(2)
$$x, \quad x+2 \quad \text{are even consecutive No's}$$

$$(x)^2 + (x+2)^2 = 52$$
$$x^2 + x^2 + 4x + 4 = 52$$
$$2x^2 + 4x - 48 = 0$$
$$x^2 + 2x - 24 = 0$$
$$(x - 4)(x + 6) = 0$$
$$x = 4 \qquad x = -6$$

The 2 No's are $4 \, \& \, 6$ or $-6, -4$

(3) $\quad P = 62 \qquad \text{length} = x, \quad \text{width} = y$
$\qquad A = 198$

③ $P = 62$
$A = 198$ $\|$ $x = $ length $y = $ width

$$2x + 2y = 62 \longrightarrow x + y = 31$$
$$\underline{xy = 198}$$

$x = 31 - y$ (isoslate)

$(31 - y)y = 198$ (sub in)

$31y - y^2 = 198$
$y^2 - 31y + 198 = 0$
$(y - 22)(y - 9) = 0$
$y = 22$ $y = 9$.
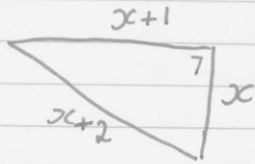
$\Rightarrow$ $x = 31 - y$
      $x = 31 - 22$ $x = 31 - 9$
       $x = 9$ $x = 22$.

$\Rightarrow$ length $= 22$ and width $= 9$

Q4

$x+1$

7

x

$x+2$

$$x^2 + (x+1)^2 = (x+2)^2$$
$$x^2 + x^2 + 2x + 1 = x^2 + 4x + 4$$
$$x^2 - 2x - 3 = 0$$
$$(x-3)(x+1) = 0$$
$$x = 3 \qquad x = -1$$

length cannot be neg

The 3 sides are 3, 4, & 5.

$$\Rightarrow \text{Perimeter} = 3 + 4 + 5 = 12$$

Q5

$$s = 12t - t^2$$

$$25 = 12t - t^2$$
$$t^2 - 12t + 25 = 0 \qquad \text{2 dec places} \Rightarrow \text{formula}$$

$$a = 1 \qquad b = -12 \qquad c = 25$$

$$t = \frac{12 \pm \sqrt{144 - 100}}{2}$$

$$= \frac{12 \pm \sqrt{44}}{2}$$

$$t = 9.32 \qquad t = 2.68$$

Q6

$$x^2 - 15 = 2x$$
$$x^2 - 2x - 15 = 0$$
$$(x + 3)(x - 5) = 0$$
$$x = -3 \qquad x = 5$$

Q7

$$h = -16t^2 + 24t + 1$$
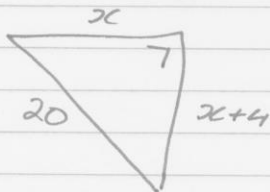$$6 = -16t^2 + 24t + 1$$

$$16t^2 - 24t + 5 = 0$$
$$(4t - 1)(4t - 5) = 0$$
$$4t = 1 \qquad 4t = 5$$
$$t = 1/4 \qquad t = 5/4$$

$$= 0.25 \sec \qquad or \qquad 1.25 \sec$$

Q8

$$x^2 + (x+4)^2 = 20^2$$

$$x^2 + x^2 + 8x + 16 = 400$$
$$2x^2 + 8x - 384 = 0$$
$$x^2 + 4x - 192 = 0$$
$$(x - 12)(x + 16) = 0$$
$$x = 12 \qquad x = -16$$

cannot be neg.

Ans: $x = 12$

Q9

x, $x+2$ are 2 consecutive odd N°'s

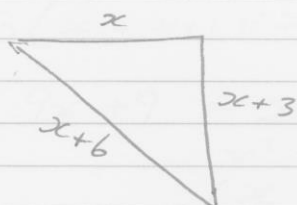$(x)(x+2) = 4(x + x + 2) - 1$

$x^2 + 2x = 4x + 4x + 8 - 1$
$x^2 - 6x - 7 = 0$
$(x - 7)(x + 1) = 0$
$x = 7$ $x = -1$

The 2 N°'s are   7 r 9   or $-1, 1$

Q10

$(x)^2 + (x+3)^2 = (x+6)^2$
$x^2 + x^2 + 6x + 9 = x^2 + 12x + 3$
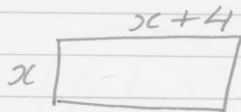
$2x^2 + 6x + 9 = x^2 + 12x + 36$
$x^2 - 6x - 27 = 0$
$(x + 3)(x - 9) = 0$
$x = -3$ $x = 9$
cannot be neg

Shortest shide = 9.

Q11

x [rectangle with top label $x+4$]

$$(x)(x+4) = 60$$
$$x^2 + 4x = 60$$
$$x^2 + 4x - 60 = 0$$
$$(x - 6)(x + 10) = 0$$
$$x = 6 \qquad x = -10$$

Width $= 6 \qquad$ length $= 10$.

Q12

$$x, \quad x+1, \quad x+2$$

$$3(x + x+1 + x+2) = (x+1)(x+2)$$

$$9x + 9 = x^2 + 3x + 2$$
$$x^2 - 6x - 7 = 0$$
$$(x - 7)(x + 1) = 0$$
$$x = 7 \qquad x = -1$$

$7, 8, 9, \qquad\qquad -1, 0, 1.$

Q13

$r = 14$

$$Area\ deck = Large\ Cir - Small\ Cir$$

$$\pi r^2 \quad \pi r^2$$

$$60\pi = (14+x)^2 \pi - 14^2 \pi$$
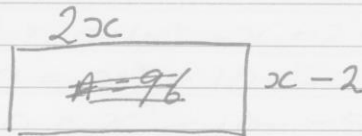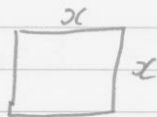
$$60 = (14+x)^2 - 14^2$$

$$60 = 196 + 28x + x^2 - 196$$

$$x^2 + 28x - 60 = 0$$

$$(x + 30)(x - 2) = 0$$

$$x = -30 \qquad x = 2$$

Q14

$$A = x^2 + 96$$

$$2x(x-2) = x^2 + 96$$

$$2x^2 - 4x = x^2 + 96$$

$$x^2 - 4x - 96 = 0$$

$$(x - 12)(x + 8) = 0$$

$$x = 12 \qquad x = -8$$

Rec: Length $= 2x = \underline{24}$ Width $= x - 2 = \underline{10}$

15 $h = 0.1x^2 - x + 2.5$

at G: $h = 1.5$ $\Rightarrow$ $1.5 = 0.1x^2 - x + 2.5$ (× 10)

$$15 = x^2 - 10x + 25$$
$$0 = x^2 - 10x + 10$$

Decimal ans $\Rightarrow$ Use formula.

$a = 1$ $\quad$ $b = -10$ $\quad$ $c = 10$

$$x = \frac{10 \pm \sqrt{100 - 40}}{2}$$

$$= \frac{10 \pm \sqrt{60}}{2} \quad \longrightarrow 8.87$$

$$\longrightarrow \boxed{1.13}$$

At C: $h = 3$ $\Rightarrow$ $3 = 0.1x^2 - x + 2.5$ (× 10)

$$30 = x^2 - 10x + 25$$
$$0 = x^2 - 10x - 5$$

$a = 1$ $\quad$ $b = -10$ $\quad$ $c = -5$

$$x = \frac{10 \pm \sqrt{100 + 20}}{2}$$

$$= \frac{10 \pm \sqrt{120}}{2} \quad \longrightarrow \boxed{10.48}$$

$$\longrightarrow -0.48$$

Dis $\Rightarrow$ $10.48 - 1.13 = 9.35$

16

$$3t - s = 4$$
$$2t^2 + s^2 = 43$$

$$s = (3t - 4)$$

$$2t^2 + (3t-4)^2 = 43$$
$$2t^2 + 9t^2 - 24t + 16 = 43$$
$$11t^2 - 24t - 27 = 0$$

$$a = 11 \qquad b = -24 \qquad c = -27$$

$$t = \frac{24 \pm \sqrt{576 + 1188}}{22}$$

$$= \frac{24 \pm \sqrt{1764}}{22} \qquad \nearrow \boxed{3}$$
$$\searrow -0.81$$

$$t = 3 \qquad \Rightarrow \qquad s = 3t - 4$$
$$9 - 4$$
$$= 5.$$

Negative Value not possible. as time cannot be neg.

17

$$x^2 + 6y^2 = 40$$
$$\underline{x + 3y = 5}$$
$$x = (5 - 3y)$$

$$(5 - 3y)^2 + 6y^2 = 40$$

$$25 - 30y + 9y^2 + 6y^2 = 40$$

$$15y^2 - 30y - 15 = 0$$
$$y^2 - 2y - 1 = 0$$

$$y = \frac{+2 \pm \sqrt{4 - 4(1)(-1)}}{2(1)}$$

$$= \frac{2 \pm \sqrt{8}}{2} \quad \longrightarrow \quad 2.4$$
$$\searrow \quad -0.4$$

Find x: $x = 5 - 3y$

$x = 5 - 3(2.4)$ r $x = 5 - 3(-0.4)$
$x = -2.2$ $x = 6.2$

$$(-2.2, 2.4) \qquad\qquad (6.2, -0.4)$$

Q 17 contd.

$$x + 3y = H$$
$$x^2 + 6y^2 = 40$$
$$x = (H - 3y)$$

$$(H - 3y)^2 + 6y^2 = 40$$

$$H^2 - 6Hy + 9y^2 + 6y^2 = 40$$

$$15y^2 - 6Hy + H^2 - 40 = 0.$$

For eqns not to intersect $\Rightarrow b^2 - 4ac < 0$

$$(-6H)^2 - 4(15)(H^2 - 40) < 0$$

$$36H^2 - 60H^2 + 2400 < 0$$
$$-24K^2 + 2400 < 0 \quad (\times -1)$$
$$24K^2 - 2400 > 0$$
$$24H^2 > 2400$$
$$H^2 > 100$$
$$K > \pm\sqrt{100}$$
$$H > 10 \qquad \text{use pos Ans.}$$