ANSWERS : EQUIVALENT FIGURES

① Old tank

$l = 90$
$w = 1.25(x)$
$h = 1.5x + 4$

New tank

$l = 1\frac{1}{3}(90) = 120$
$w = 1.5x$
$h = x$

$l \cdot w \cdot h = l \cdot w \cdot h$

$90(1.25x)(1.5x+4) = 120(x)(1.5x)$

$112.5x(1.5x+4) =$

$168.75x^2 + 450x = 180x^2$

$168.75x^2 - 180x^2 + 450x = 0$

$-11.25x^2 + 450x = 0$

$-11.25x(x - 40) = 0$

$x = 40$

Width old tank $= 1.25x = 1.25(40) =$ 50 cm

Width new tank $= 1.5x = 1.5(40) =$ 60 cm

60 cm − 50 cm = (10 cm)

(2) Box A Box B

Box A	Box B
$l = 7cm$	$l = 10cm$
$w = x$	$w = .5(2.4x)$
$h = 2.4x$	$h = 2.4x - 5$

$$l \cdot w \cdot h = l \cdot w \cdot h$$

$$7(x)(2.4x) = (10)(1.2x)(2.4x-5)$$

$$16.8x^2 = 12x(2.4x-5)$$

$$16.8x^2 = 28.8x^2 - 60x$$

$$16.8x^2 - 28.8x^2 + 60x = 0$$

$$-12x^2 + 60x = 0$$

$$-12x(x-5) = 0 \qquad x = 5$$

height box A $= 2.4x = 2.4(5) = 12cm$

height box B $= 2.4x - 5 = 12cm - 5cm = 7cm$

Difference in heights $= 12cm - 7cm$

$= \boxed{5cm}$

3.

Block	Pyramid
$l = 10\,cm$	$l = 1.5x + 4$
$w = x$	$w = 18\,cm$
$h = 1.5x$	$h = x + 2$

$$l \cdot w \cdot h = \frac{1}{3}(1.5x+4)(18)(x+2)$$

$$(10)(x)(1.5x) = 6(1.5x+4)(x+2)$$

$$15x^2 = (9x+24)(x+2)$$

$$15x^2 = 9x^2 + 18x + 24x + 48$$

$$15x^2 - 9x^2 - 18x - 24x - 48 = 0$$

$$6x^2 - 42x - 48 = 0$$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$$= \frac{42 \pm \sqrt{(-42)^2 - 4(6)(-48)}}{2(6)}$$

$$= \frac{42 \pm \sqrt{1764 + 1152}}{12}$$

$$= \frac{42 \pm 54}{12} \quad \begin{matrix} (+) \rightarrow (8) \\ (-) \rightarrow -1 \end{matrix}$$

Block height $= 1.5x = (1.5)(8) = 12\,cm$

Pyramid height $= x + 2 = 8 + 2 = 10\,cm$

The height difference is (2cm).

4.

Toblerone bar	Block
$l = 2x + 33$	$l = x + .5x = 1.5x$
$w = 73\text{cm}$	$w = x - 9$
$h = x$	$h = 73\text{cm}$

$$V_{TOB} = V_{BLOCK}$$

$$\tfrac{1}{2}(h)(w)(l) = l(w)(h)$$

$$\tfrac{1}{2}(x)(73)(2x+33) = (1.5x)(x-9)(73)$$

$$36.5x(2x+33) = 109.5x(x-9)$$

$$73x^2 + 1204.5x = 109.5x^2 - 985.5x$$

$$73x^2 - 109.5x^2 + 1204.5x + 985.5x = 0$$

$$-36.5x^2 + 2190x = 0$$

$$-36.5x(x-60) = 0$$

$$x_1 = 0 \qquad \boxed{x_2 = 60}$$

Toblerone	Block
$l = 2(60) + 33 = 153\text{cm}$	$l = 90\text{cm}$
$w = 73\text{cm}$	$w = 51\text{cm}$
$h = 60\text{cm}$	$h = 73\text{cm}$

$153\text{cm} - 90\text{cm} = \boxed{63\text{cm}}$ difference in length

5.

A	B
$L = 300\,cm$	$L = 183\,cm$
$W = 2x + 4$	$W = 2x$
$H = x$	$H = 2x - 40$

$$300x(2x+4) = (2x)(183)(2x-40)$$

$$600x^2 + 1200x = 366x(2x-40)$$

$$600x^2 + 1200x = 732x^2 - 14640x$$

$$600x^2 - 732x^2 = -14640x - 1200x$$

$$600x^2 + 1200x - 732x^2 + 14640x = 0$$

$$-132x^2 + 15840x = 0$$

$$-132x(x - 120) = 0$$

$$x = 120$$

$$W_A = 2x + 4$$
$$= 2(120) + 4$$
$$= 244\,cm$$

$$W_B = 2x$$
$$= 2(120\,cm)$$
$$= 240\,cm$$

Dumster A has the greater width. Its width is 4cm greater than that of dumpster B.

6. triangle rectangle

$b = 3x$ $\quad l = 2(3x) = 6x$

$h = 3x + 2$ $\quad w = x$

$$A_T = A_R$$

$$\frac{1}{2}(3x)(3x+2) = 6x(x)$$

$$1.5x(3x+2) = 6x^2$$

$$4.5x^2 + 3x = 6x^2$$

$$4.5x^2 - 6x^2 + 3x = 0$$

$$-1.5x^2 + 3x = 0$$

$$-1.5x(x-2) = 0$$

$$x = 2$$

altitude of triangle $= 3x + 2$

$= 3(2) + 2$

$= 6 + 2$

$= 8$ cm

7. Rectangle

$l = 2x - 2$

$w = x$

Square

$s = x + 3$

$$l \cdot w = s^2$$

$$x(2x-2) = (x+3)^2$$

$$2x^2 - 2x = x^2 + 6x + 9$$

$$2x^2 - x^2 - 2x - 6x - 9 = 0$$

$$x^2 - 8x - 9 = 0$$

$$(x-9)(x+1) = 0$$

$$x = 9$$

Rectangle

$w = 9\text{cm}$

$l = 2x - 2$

$= 2(9) - 2$

$= 18 - 2$

$= 16$

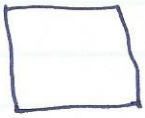
Perimeter Rectangle

$= 2(16) + 2(9)$

$= 32 + 18$

$= 50\text{cm}$

Square



$s = x + 3$

$= 9 + 3 = 12$

Perimeter Square $= 4(12)$

$= 48\text{ cm}$

8. Δ_{ABC} $\square_{BCED}$

$b = x + 10$ $\quad$ $l = x + 10$

$h = 12\,cm$ $\quad$ $w = x$

$\frac{1}{2} b h = l \cdot w$

$\frac{1}{2}(x+10)(12) = x(x+10)$

$6(x+10) = x^2 + 10x$

$6x + 60 = x^2 + 10x$

$-x^2 + 6x - 10x + 60 = 0$

$-x^2 - 4x + 60 = 0$

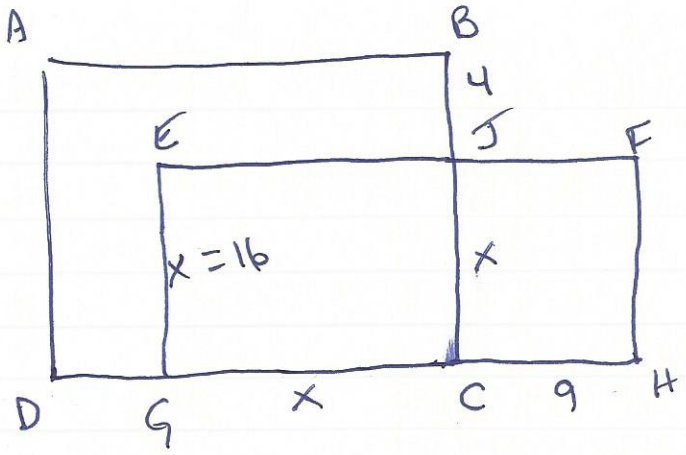
$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{4 \pm \sqrt{(-4)^2 - 4(-1)(60)}}{2(-1)}$

$= \frac{4 \pm \sqrt{16 + 240}}{-2} = \frac{4 \pm \sqrt{256}}{-2}$

$= \frac{4 \pm 16}{-2}$ $\quad \nearrow \frac{-12}{-2} = 6$

The width of the rectangle is 6 cm.

9.



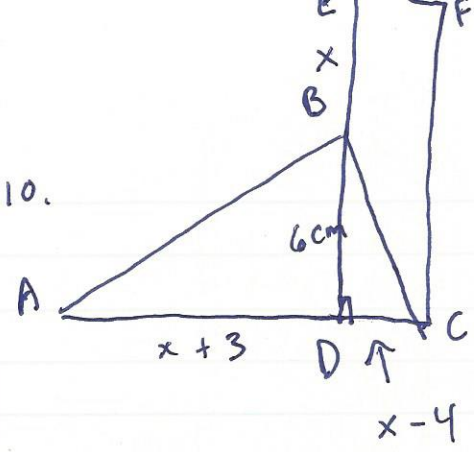
$$(x+4)^2 = (x+9)(x)$$

$$x^2 + 8x + 16 = x^2 + 9x$$

$$16 = x$$

Perimeter EJCG = 4 (16 cm)
= 64 cm

10.



$$A_{\triangle} = A_{\square}$$

$$\frac{1}{2}(b)(h) = l \cdot w$$

$$\frac{1}{2}(x+3+x-4)(6) = (6+x)(x-4)$$

$$\frac{1}{2}(2x-1)(6) = 6x - 4x + x^2 - 24$$

$$3(2x-1) = x^2 + 2x - 24$$

$$6x - 3 - x^2 - 2x + 24 = 0$$

$$-x^2 + 4x + 21 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-4 \pm \sqrt{4^2 - 4(-1)(21)}}{2(-1)}$$

$$= \frac{-4 \pm \sqrt{16 + 84}}{-2} = \frac{-4 \pm 10}{-2} = \frac{-14}{-2} = 7$$

$x = 7$

width of rectangle =

$x - 4 = 7 - 4 =$ 3 cm