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9. **a)** The surface area of the box is the sum of the area of its 6 sides, and this area must be 1720 cm^2. Therefore:

$$2x(x+1) + 2x(x+5) + 2(x+1)(x+5) = 1720$$
$$2x^2 + 2x + 2x^2 + 10x + 2x^2 + 12x + 10 = 1720$$
$$6x^2 + 24x + 10 = 1720$$
$$6x^2 + 24x - 1710 = 0$$
$$x^2 + 4x - 285 = 0$$

b) The solution for $x^2 + 4x - 285 = 0$ is $x = 15$ or $x = -19$.
The value of x must be positive since it represents the height of the box; it is therefore 15. By evaluating the other expressions using $x = 15$, the other dimensions of the box are found. It therefore measures 15 cm by 16 cm by 20 cm.

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11.

a) $x = 0$ or $x = 8$.	**b)** $x = 4$ or $x = -4$.	**c)** $x = 4$
d) $x = 1$ or $x = 2$.	**e)** $x = -9$ or $x = 4$.	**f)** $x = -9$ or $x = -4$.
g) $x = -\frac{1}{2}$ or $x = 2$.	**h)** $x = \frac{1}{3}$	**i)** $x = -\frac{5}{2}$ or $x = 3$.
j) $x = \frac{3}{4}$ or $x = -\frac{5}{2}$.	**k)** $x = -\frac{5}{2}$ or $x = \frac{2}{5}$.	**l)** Impossible.

13. **a)** Fabian's new cabin would have a floor measuring 3 m by 4 m.
Approach: Let x be the increase of the length and width in metres.
Since at the beginning, these dimensions were 3 m by 2 m respectively, the new dimensions are therefore represented by $(3 + x)$ and $(2 + x)$. The area of the new floor is 12 m^2, or $2 \times (2 \times 3)$. Therefore we have the equation
$(3 + x)(2 + x) = 12$.
The solution is $x = 1$ or $x = -6$. According to the context, the value of the x variable must be greater than -2. The solution where $x = -6$ must be rejected.
1 m must therefore be added to each dimension.

b) Fabian's new cabin would have a floor measuring approximately 3.29 m by 3.65 m. Approach: Let x be the increase of the length in metres. In this case, the increase of the width is $2x$ and the situation translates to the equation
$(3 + x)(2 + 2x) = 12$.
This equation is equivalent to $x^2 + 4x - 3 = 0$.
Since there are no integers where the product is -3 and the sum is 4, one must proceed by completing the square. Therefore $x = -2 \pm \sqrt{7}$ is found.
According to the context, the value of the x variable must be greater than -1.
The solution where $x = -2 - \sqrt{7}$ is rejected.
The length of the new cabin:
$3 + x = 3 + (-2 + \sqrt{7}) = 1 + \sqrt{7} \approx 3.65$.
The width of the new cabin:
$2 + 2x = 2 + 2(-2 + \sqrt{7}) = -2 + 2\sqrt{7} \approx 3.29$.

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16. The perimeter of the rhombus is 16 cm.
Approach: Let x be the length of the big diagonal in centimetres.
Therefore $(x - 2)$ represents the length of the small diagonal.
The following equation is obtained: $\frac{x(x-2)}{2} = 15$.
This equation is equivalent to $x^2 - 2x - 30 = 0$.
The trinomial does not decompose into factors.
By completing the square $x = 1 \pm \sqrt{31}$.
Only the positive solution is retained. The big diagonal therefore measures $(1 + \sqrt{31})$ cm. The small diagonal measures 2 cm less, which is $(^-1 + \sqrt{31})$ cm.

The measurement of one side: $\sqrt{\left(\frac{1+\sqrt{31}}{2}\right)^2 + \left(\frac{^-1+\sqrt{31}}{2}\right)^2} = \sqrt{16}$
$= 4$

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19. Let x be Anika's age and y Tony's age.
The situation is translated by the following equation: $x^2 - xy = xy - y^2$.
This equation is equivalent to: $x^2 - 2xy + y^2 = 0$

$$(x - y)^2 = 0$$
$$x - y = 0$$

Anika and Tony are therefore the same age (they are twins).

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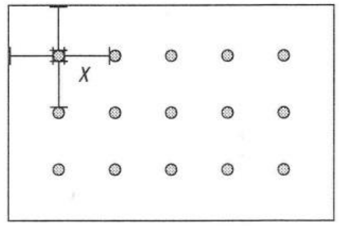
21. Let x be the height of the Lighthouse of Alexandria.
By Pythagorean theorem, the equation
$40^2 + 6380^2 = (6380 + x)^2$.
The solution is $x = ^-6380 \pm \sqrt{40^2 + 6380^2}$.
The negative solution must be rejected.
Therefore $x = ^-6380 + \sqrt{40^2 + 6380^2} \approx 0.125$.
The height of the lighthouse was approximately 125 m.

23. Let x be the distance that separates two successive columns in one row. The same distance is found between each row and between the walls of the parking lot and the closest columns. Here is a diagram representing this situation:



The length of the rectangular surface of the parking lot is $6x + 5$.
Its width is $(4x + 3)$.
The situation is translated by the equation
$(6x + 5)(4x + 3) = 1650$.
This equation is equivalent to $24x^2 + 38x - 1635 = 0$.
By factoring the trinomial, the following is obtained:
$(12x + 109)(2x - 15) = 0$
$x = -\frac{109}{12}$ or $x = \frac{15}{2}$.
Only the positive solution must be retained, which is $\frac{15}{2}$.
The distance that separates each column is therefore 7.5 m.

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26. Let n be the measurement of the smallest side of a right triangle and $n + 1$ and $n + 2$ the measurements of the other sides.

By Pythagorean theorem, $n^2 + (n + 1)^2 = (n + 2)^2$.

This equation is equivalent to:

$$n^2 - 2n - 3 = 0$$
$$(n - 3)(n + 1) = 0$$
$$n = 3 \text{ or } n = -1.$$

Since n is positive, the only solution is $n = 3$.
Numbers 3, 4 and 5 are therefore the only consecutive numbers that Melanie can use.