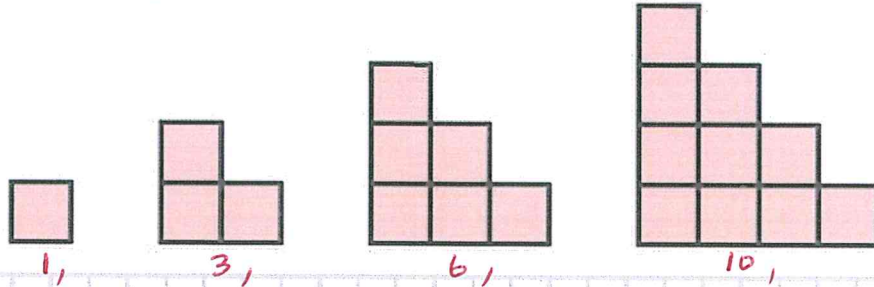


30mins  
MAX

60

1. By converting the number of squares in the following designs into a number pattern, write down a rule for the pattern. Use the rule to find out how many bricks are needed to build the 49th design.



1, 3, 6, 10

2, 3, 4

1, 1

$2a = 1, a = \frac{1}{2}$

$T_n = \frac{1}{2}n^2 + bn + c$

$T_1 = \frac{1}{2}(1)^2 + b(1) + c = 1 \Rightarrow b + c = \frac{1}{2}(x-2)$

$T_2 = \frac{1}{2}(2)^2 + b(2) + c = 3 \Rightarrow 2b + c = 1$

$\underline{-2b - 2c = -1}$

$-c = 0$   
 $c = 0$   
 $b = \frac{1}{2}$

$T_n = \frac{n^2}{2} + \frac{n}{2}$

$T_{49} = \frac{49^2}{2} + \frac{49}{2} = 1225$

(0, 2, 5, 7, 10)

2.) Solve:  $\frac{2}{3}(x-1) - \frac{1}{5}(x-3) = x+1$

$(5)(3) \frac{2}{3}(x-1) - \frac{1}{5}(x-3)(3)(5) = (x+1)(3)(5)$

$10x - 10 - (3x - 9) = 15x + 15$

$7x - 1 = 15x + 15$

$-8x = 16$

$x = -2$

(0, 2, 5, 7, 10)

20

- 3.) The circle  $x^2 + y^2 + ax + by + c = 0$  passes through the points  $(1, 0)$ ,  $(1, 2)$  and  $(2, 1)$ . Find the values of  $a$ ,  $b$ , and  $c$ .

$$(1)^2 + (0)^2 + a(1) + b(0) + c = 0 \Rightarrow a + c = -1 \quad \checkmark$$

$$(1)^2 + (2)^2 + a(1) + b(2) + c = 0 \Rightarrow a + 2b + c = -5$$

$$(2)^2 + (1)^2 + a(2) + b(1) + c = 0 \Rightarrow 2a + b + c = -5$$

$$\begin{array}{r} a + 2b + c = -5 \\ -2a - b - c = 5 \end{array}$$

$$\begin{array}{r} a + 2b + c = -5 \\ -4a - 2b - 2c = 10 \end{array}$$

$$-3a - c = 5$$

$$3a + 3c = -3$$

$$2c = 2$$

$$c = 1$$

$$\Rightarrow a = -2$$

$$\Rightarrow b = -2$$

$$(0, 2, 5, 7, 10, 12, 15) \quad \checkmark$$

4.)

Solve to find  $x, y, z$ :

$$\frac{x}{3} + \frac{y}{2} - z = 7$$

$$\frac{x}{4} - \frac{3y}{2} + \frac{z}{2} = -6$$

$$\frac{x}{6} - \frac{y}{4} - \frac{z}{3} = 1$$

Handwritten solution on grid paper:

$$\begin{aligned} 2x + 3y - 6z &= 42 \\ x - 6y + 2z &= -24 \\ 2x - 3y - 4z &= 12 \end{aligned}$$

Subtracting the second equation from the first:

$$4x - 10z = 54$$

Subtracting the second equation from the third:

$$x - 6y + 2z = -24$$

$$-4x + 6y + 8z = -24$$


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$$-3x + 10z = -48$$

$$4x - 10z = 54$$


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Solution:

$$x = 6, \quad z = -3, \quad y = 4$$

Options: (0, 2, 5, 7, 10, 12, 15)

5.) 44 000 people attended a match in Croke Park. The two ticket prices on the day were €30 and €20. The total receipts for the game came to €1.2 million.

How many people paid the higher ticket price?

$x = \#$  €30 tickets  
 $y = \#$  €20 tickets

Handwritten solution on grid paper:

$$\begin{aligned} x + y &= 44000 \\ 30x + 20y &= 1200000 \end{aligned}$$

$$\begin{aligned} 3x + 2y &= 120000 \\ -2x - 2y &= -88000 \end{aligned}$$


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$$x = 32000 \quad \checkmark$$

Options: (0, 2, 5, 7, 10)