Answer # 1 (Spring 2010 Question # 1a)

We know that:

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

Here r = 3 and $S_n = 364a$

$$\Rightarrow 364a = \frac{a(3^n - 1)}{3 - 1}$$

$$\Rightarrow 364 = \frac{(3^n - 1)}{2}$$

$$\Rightarrow 729 = 3^n$$

$$\Rightarrow 3^6 = 3^n$$

Since bases are same, exponents will be equal:

$$\Rightarrow n = 6$$

Answer # 2 (Autumn 2011 Question # 2a)

Since it is a Geometric Progression, we would use the relation:

$$S = \frac{a(r^n - 1)}{r - 1}$$

Here:

s = Summation of payments
a = Re. 1
n = 7

$$r = \frac{3}{1} = 3$$

$$S = \frac{1(3^7 - 1)}{3 - 1} = \frac{(2187 - 1)}{2} = 1{,}093$$

Since the amount obtained through alternative is less than Rs. 1,200, hence Bashir has taken a wise decision by accepting the pocket money of Rs. 1,200.

Answer # 3 (Spring 2012 Question # 1b)

1st number after 170 divisible by 8 = 176
Last number before 1,000 divisible by 8 = 992
Thus, the A.P. =176, 184, ... 992
S_n= 176 +184 + ... +992

Where,

first term: a = 176; common difference: d = 184 – 176 = 8
and last term: L = 992
We know that a = L – (n-1)d

$$\therefore n = \left(\frac{L-a}{d}\right)+1$$

$$\Rightarrow n = \left(\frac{992-176}{8}\right)+1 = \frac{816}{8}+1 = 102+1 = 103$$

Since $S_n = \frac{n}{2}(a+l)$

$$\therefore S_n = \frac{103}{2}(176+992) = \frac{103}{2}(1168) = 103(584) = 60{,}152$$

Answer # 4 (Autumn 2012 Question # 1a)

The given scenario is an example of arithmetic series.

The sum of an arithmetic series is given by:

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

In the given situation, $S_n = 500{,}000$; a = 10,000 and d = 500

$$500{,}000 = \frac{n}{2}[2(10{,}000) + (n-1)(500)]$$
$$1{,}000{,}000 = n(20{,}000 + 500n - 500)$$
$$1{,}000{,}000 = 500n^2 + 19{,}500n$$
$$500n^2 + 19{,}500n - 1{,}000{,}000 = 0$$

Dividing both sides by 500 we get:

$$n^2 + 39n - 2{,}000 = 0$$

According to Quadratic Formula

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

where $x = n$, $a = 1$, $b = 39$ and $c = -2{,}000$

$n = \frac{-39 \pm \sqrt{(39)^2-4(1)(-2{,}000)}}{2(1)} = \frac{-39 \pm \sqrt{1521+8{,}000}}{2} = \frac{-39 \pm \sqrt{9{,}521}}{2}$

$n = \frac{-39 \pm 97.58}{2} = 29.29 \text{ or } -68.29$

Since n cannot be negative, hence Sadiq's aggregate savings would **exceed** Rs.500,000 in 30 months.