**HILLEL ACADEMY HIGH**
**MATHEMATICS DEPARTMENT**

**IB - MATHEMATICS SL**

**NAME:_____** **DATE:_____**

***Complete the following questions showing all work!***

**1.** Find the sum of the arithmetic series

$$17 + 27 + 37 + ... + 417.$$

*Working:*

*Answer*:

.....

**(Total 4 marks)**

**2.** An arithmetic series has five terms. The first term is 2 and the last term is 32. Find the sum of the series.

*Working:*

*Answer:*

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**(Total 4 marks)**

**3.** In an arithmetic sequence, the first term is 5 and the fourth term is 40. Find the second term.

*Working:*

*Answer:*

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**(Total 4 marks)**

**4.** $1000 is invested at the beginning of each year for 10 years.

The rate of interest is fixed at 7.5% per annum. Interest is compounded annually.

Calculate, giving your answers to the nearest dollar

(a) how much the first $1000 is worth at the end of the ten years;

(b) the total value of the investments at the end of the ten years.

*Working:*

*Answers*:

(a) .....

(b) .....

**(Total 4 marks)**

**5.** Find the sum of the infinite geometric series

$$\frac{2}{3}-\frac{4}{9}+\frac{8}{27}-\frac{16}{81}+...$$

*Working:*

*Answer:*

.....

**(Total 4 marks)**

**6.** The following table shows four series of numbers. One of these series is geometric, one of the series is arithmetic and the other two are neither geometric nor arithmetic.

(a) Complete the table by stating the type of series that is shown.

| Series | | Type of series |
|---|---|---|
| (i) | $1+11+111+1111+11111+\ldots$ | |
| (ii) | $1+\frac{3}{4}+\frac{9}{16}+\frac{27}{64}+\ldots$ | |
| (iii) | $0.9+0.875+0.85+0.825+0.8+\ldots$ | |
| (iv) | $\frac{1}{2}+\frac{2}{3}+\frac{3}{4}+\frac{4}{5}+\frac{5}{6}+\ldots$ | |

(b) The geometric series can be summed to infinity. Find this sum.

*Working:*

*Answer:*

(b) ……..

**(Total 6 marks)**

**7.** (a) Write down the first three terms of the sequence $u_n = 3n$, for $n \geq 1$.

**(1)**

(b) Find

(i) $\sum_{n=1}^{20} 3n$;

(ii) $\sum_{n=21}^{100} 3n$.

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**(5)**
**(Total 6 marks)**

**8.** The *Acme* insurance company sells two savings plans, Plan A and Plan B.

For Plan A, an investor starts with an initial deposit of \$1000 and increases this by \$80 each month, so that in the second month, the deposit is \$1080, the next month it is \$1160 and so on.

For Plan B, the investor again starts with \$1000 and each month deposits 6% more than the previous month.

(a) Write down the amount of money invested under Plan B in the second and third months.

**(2)**

*Give your answers to parts (b) and (c) correct to the nearest dollar.*

(b) Find the amount of the 12th deposit for each Plan.

**(4)**

(c) Find the total amount of money invested during the first 12 months

(i) under Plan A;

**(2)**

(ii) under Plan B.

**(2)**

**(Total 10 marks)**

**9.** Portable telephones are first sold in the country *Cellmania* in 1990. During 1990, the number of units sold is 160. In 1991, the number of units sold is 240 and in 1992, the number of units sold is 360.

In 1993 it was noticed that the annual sales formed a geometric sequence with first term 160, the 2nd and 3rd terms being 240 and 360 respectively.

(a) What is the common ratio of this sequence?

**(1)**

Assume that this trend in sales continues.

(b) How many units will be sold during 2002?

**(3)**

(c) In what year does the number of units sold first exceed 5000?

**(4)**

Between 1990 and 1992, the total number of units sold is 760.

(d) What is the total number of units sold between 1990 and 2002?

**(2)**

During this period, the total population of *Cellmania* remains approximately 80 000.

(e) Use this information to suggest a reason why the geometric growth in sales would not continue.

**(1)**

**(Total 11 marks)**