

## GENERAL EDUCATION AND TRAINING CERTIFICATE

## NQF LEVEL 1

## ABET LEVEL 4 SITE-BASED ASSESSMENT

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| **LEARNING AREA** | **:** | **MATHEMATICS AND MATHEMATICAL SCIENCES** |
| **CODE** | **:** | **MMSC4** |
| **TASK** | **:** | **WORKSHEET** |
| **TIME** | **:** | **2 HOURS** |
| **MARKS** | **:** | **50** |

**This assessment task consists of 7 pages**.

**GENERAL EDUCATION AND TRAINING CERTIFICATE**

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| **INSTRUCTIONS AND INFORMATION** |  |  |

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| 1. | Answer ALL the questions on this WORKSHEET and hand in the completed task. |  |  |

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| 2. | Write the CENTRE and your NAME in the spaces provided. |  |  |

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| 3. | Calculators may be used, but you must show ALL calculations. |  |  |

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| 4. | Read the questions carefully before you write down your answers. |  |  |

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| 5. | Write legibly and present your work clearly. |  |  |

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| 6. | Write the answers in blue or black ink. |  |  |

**CENTRE**:………………………………………… **NAME**:…………………………………………

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| Unit standard 7448 addresses Patterns in general. SO 3, AC1-3 and SO 5, AC 1-2 wants us to find the General Term of the pattern. In this Worksheet we are going to look at 2 different ways of determining the General Term of a linear pattern. |  |  |

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| ACTIVITY 1 |  |  |

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| 1.1 | Consider the pattern with general term: |  |  |

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| --- | --- | --- | --- |
|  | Write down the first THREE (3) terms by substituting n = 1, 2 and 3. |  |  |

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|  | T1 = ………………………………………………………………………………….… |  | (2) |

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|  | T2 = ………………………………………………………………………………….… |  | (2) |

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|  | T3 = ………………………………………………………………………………….… |  | (2) |

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|  | Now calculate the common difference between the terms in the following way: |  |  |

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|  | T2 – T1 = ………………………………OR T3 – T2 = …………………….…………  Your answers should be the same!! This is the value that we add each time to get the next term. We say the **common difference** is **constant.** |  | (1) |

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|  | What do you notice about the common difference and the coefficient of n in ?  …………………………………………………………………………………………. |  | (1) |

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| 1.2 | Consider the pattern with general term: |  |  |

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|  | Write down the first THREE (3) terms by substituting n = 1, 2 and 3. |  |  |

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|  | T1 = … |  | (2) |

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|  | T2 = … |  | (2) |

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| --- | --- | --- | --- |
|  | T3 = … |  | (2) |

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|  | Now calculate the common difference between the terms in the following way: |  |  |

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|  | T2 – T1 = …………………………. OR T3 – T2 = ………………………….………  Are your answers the same? .......... The common difference is therefore ……. |  | (1) |

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|  | What do you notice about the common difference and the coefficient of n in  …………………………………………………………………………………………. |  | (1) **[16]** |

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| ACTIVITY 2 |  |  |

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| Patterns where the common difference is constant are called LINEAR PATTERNS. From 1.1 and 1.2 it should be clear that the General Rule for a linear pattern is a linear equation in the form:, where is the *n*-th term, *n* is the number of terms and *d* and *c* are variables depending on the pattern. This Activity focuses on determining the value of *c* in a linear pattern. |  |  |

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| METHOD 1: Finding *c* by substitution |  |  |

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| We know now that the equation will be in the form : From your conclusions in 1.1 and 1.2 it should also be obvious that *d*, the coefficient of n, is equal to the common difference.To find c, we substitute *n* = 1 and the value of *T1* in the equation. Let’s show this by doing an example. |  |  |

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| 2.1 | Consider the pattern: 3; 7; 11; … |  |  |

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|  | Calculate the common difference:  T2 – T1 = 7 – 3 = 4 OR  T3 – T2 = 11 – 7 = 4 (You only need to do one if it is a linear pattern) |  |  |

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|  | This value is now *d.*  Hence, we can write our equation as:*Tn* |  |  |

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|  | To calculate the value of *c*, we substitute *n* = 1 and *Tn* = 3 (the 1st term):  3 = 4(1) + *c*  3 = 4 + *c*  3 – 4 = *c*    *c* = –1  *Tn*  We can test this formula by calculating *T3*: *T3* = 4(3) – 1 = 12 – 1 = 11, which is the value of the 3rd term in the pattern. |  |  |

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| Now, try this one on your own: |  |  |

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| 2.2 | Consider the pattern: 6; 10; 14; … |  |  |

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|  | Calculate the common difference:  *T2* – *T1* = ……………. = ………….. OR *T3* – *T2* = ………………. = …………. |  | (1) |

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|  | This value is now *d.*  Hence, we can write our equation as:*Tn* |  | (1) |

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|  | To calculate the value of *c*, we substitute *n* = 1 and  = ……..(the 1st term)  …… = ………….. + *c*  …… = ……………+ *c*  ………….. = *c*    *c* = …………….  *Tn*  ………………….  Test this formula by calculating *T3: T3* = ……………..=………….. = ……..  If you did not get *T3* = 14, you made a mistake in your calculation, so check your work again. |  | (1)  (4)  (2) |

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| Here’s another one: |  |  |

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| 2.3 | Consider the pattern: 50; 37; 24; … |  |  |

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|  | *d* = T2 – T1 = ……………. = ………….. |  | (1) |

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|  | Hence, *Tn* |  | (1) |

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|  | Substitute n = 1 and = ……..  ………………………………………………………………..  ……………………………………………………………….  ………………………………………………………………..    *c* = …………….  *Tn*  ………………….  Test: *T3* = ……………..=………….. = ……..  If you did not get *T3* = 24, you made a mistake in your calculation, so check your work again. |  | (1)  (4)  (2) |

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| This formula for *Tn* enables us to determine the value of any term in the pattern, for example, if *Tn*  the 100th term will be T100 = −5(100) +1 = −500 + 1 = −499, by substituting *n* with the number of the term. We can also determine the number of terms if the general rule is given. More about this follows later. |  |  |

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| METHOD 2: Finding *c* by calculating *T0* |  |  |

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| We know now that the equation will be in the form : *Tn* And that  *d*, the coefficient of n, is equal to the common difference. To find ***c***, we calculate ***T0***, the term “before” *T1* since from *Tn*  if we substitute *n* = 0, we get *T0* = *d*(0) + *c* giving . Again, let’s show this through the following example: |  |  |

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| 2.4 | Consider the pattern: 3; 7; 11; …(as in 2.1) |  |  |

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|  | Calculate the common difference:  *d* = T2 – T1 = 7 – 3 = 4 |  |  |

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|  | Hence,*Tn* |  |  |

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|  | Now: to calculate the value of *c*, we calculate *T0*:  Since the common difference is 4 (to get the next term we **add** 4 each time), this time to get to the previous term (*T0* which will be “before” *T1*) we **subtract** 4 from 3!!  *c* = *T0* = 3 – 4  *c* = – 1  *Tn*  This is again the same formula that we found in 2.1 and we can do the test again. |  |  |

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| Now, try this one (from 2.3): |  |  |

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| 2.5 | Consider the pattern: 50; 37; 24; … |  |  |

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|  | *d =* T2 – T1 = ……………. = ………….. |  | (1) |

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|  | Hence, *Tn* |  | (1) |

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|  | Calculate c:  *c* = *T0* = ………………..  [HINT: Do the opposite of what you did to get the next term!!]  *c* = ………………….  *Tn  =*  ………………….  This should be the same as the formula found in 2.3!! |  | (3) |

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| ACTIVITY 3 |  |  |

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| In this Activity we will look at a typical problem based on a previous examination question. |  |  |

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| Consider the pattern: 9; 15; 21; … |  |  |

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| 3.1 | Is the pattern increasing or decreasing? …………………………….. |  | (1) |

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| 3.2 | Show, through calculation, that a general rule for this pattern can be given by *Tn* = *6n + 3* (Use any method). |  | (4) |

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| 3.3 | Use this general rule to determine *T31.* |  | (2) |

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| 3.4 | Use *Tn* = *6n + 3* to determine what term in this pattern will be equal to 45. |  | (4) |

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|  |  | **[11]** |

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| **TOTAL** |  | **50** |