

Assignment 1:

- Weighting: 25%
- Duration: 10 hours
- Total marks: 100
- Open/closed book: open book
- Resources required: scientific calculator.
- Learning Units covered: LU1 -2

Important to note:

- Always **show ALL workings**.
- Always include units of measurement.
- **Reference** your module manual at the end of your assignment as follows: IIE 2021. *Introduction to Quantitative Thinking and Techniques*. Module Manual. The Independent Institute of Education.
- Please reference any textbooks or resources you use to assist you in completing this assignment.

Submitting your Assignment:

- Your Assignment 1 is **due on 03 May 2021**. After 23h30 your assignment will be considered late and will **not** be marked.
- All assignments must be submitted on VCLearn. Please note, **you must accept the Integrity Declaration** for the Assignment submission link become visible. Once you have accepted the Integrity Declaration you will find the Assignment 1 submission link under 'Assessment Submissions' > 'SafeAssign Submission Links'.
- Assignments should be typed. If you do not know how to type equations on MS Word, please talk to your OT.

IQTT5111w

Assignment 1

National Support Session

ASSESSMENT SUBMISSIONS

Integrity Declaration: All submissions

Submission Links

Take-home Assessments

Question 1

Q1.1

- Demonstrate your ability to **perform basic calculations**.
- Module Manual reference: Learning Unit 1. Pages 12 - 13.

Q1.2

Q1.2.1

- Demonstrate your knowledge of **negative numbers** without the use of a calculator.
- Module Manual reference: Learning Unit 1. Page 17.

Q1.2.2

- Demonstrate your ability to **subtract fractions** without the use of a calculator.
- Module Manual reference: Learning Unit 1. Page 19.

Q1.2.3

- Use **BODMAS** to guide the order in which you perform the arithmetic operations.
- Module Manual reference: Learning Unit 1. Page 23.

Which of the four operations are you using? Show your workings!



- + - = ?

1. Find a common denominator (what you do to the bottom you do to the top).
2. Subtract the numerators.

ORDER OF OPERATIONS (i.e., what to do when):

1. Brackets
2. Of (x)
3. Division
4. Multiplication
5. Addition
6. Subtraction

When you only have division & multiplication work from left to right. Likewise, when you only have addition and subtraction work from left to right.

Question 1		(Marks: 10)
Q.1.1	Determine the answers to the following:	
Q.1.1.1	You have 17 employees who each receive a monthly salary of R13 750. How much does it cost you in total per month for these 17 employees?	(2)
Q.1.1.2	If the total cost of buying five identical desks for your company was R9 058.75, what was the cost of each desk?	(2)
Q.1.2	Solve the following:	
Q.1.2.1	$-19 - (-23)$	(2)
Q.1.2.2	$\frac{29}{4} - \frac{11}{13}$	(2)
Q.1.2.3	$\frac{(210 \div 70 + 27 \div 3) \times (50\% \text{ of } 340 - 4 \times 40 - 5)}{4^2 + 380 \div 20 - 10}$	(2)

Question 2

Q2.1

- Give the name of the **law** illustrated by the examples.
- Module Manual reference: Learning Unit 1. Page 25.

Q2.2

- Calculate the average.** Round off your final answer to three decimal places and do not forget the units of measurement.
- Module Manual reference: Learning Unit 1. Page 26.

Q2.3

- Find the missing values using your knowledge of averages.

- What is the total height of the 12 seedlings?
- Therefore, what is the total height of the remaining two seedlings?
- Now, let x equal the unknown height of one of the remaining seedlings & solve for x.

COMMUTATIVE: You can swap numbers around and still get the same answer (when you multiply/add).

ASSOCIATIVE: It does not matter how you group the numbers together (i.e., which you calculate first) when you multiply/add.

DISTRIBUTIVE: You get the same answer when you: multiply a number by a group of numbers added together OR do each multiplication separately and add them.



AVERAGE =
sum of the group
of values/number
of values in the
group.

$$\bar{x} = \frac{\sum x_i}{n}$$

Alternatively, use the formula for average, letting x equal the height of one of the remaining seedlings & solve for x.

$$\bar{x} = \frac{\sum x_i}{n}$$

Question 2

(Marks: 10)

Q.2.1	Identify which of the commutative, associative and distributive laws are illustrated in the following examples:	
Q.2.1.1	$(5 + 13) \times 19 = 5 \times 19 + 13 \times 19$	(1)
Q.2.1.2	$8 \times (10 \times 15) = 8 \times 10 \times 15$	(1)

Q.2.2	The weight (in kilograms) of 10 avocados purchased at a local fruit and vegetable store is given in the table below. What is the average weight of the avocados (to three decimal places)?	(4)										
	<table border="1"> <tr> <td>0,245</td> <td>0,315</td> <td>0,195</td> <td>0,225</td> <td>0,255</td> </tr> <tr> <td>0,230</td> <td>0,265</td> <td>0,270</td> <td>0,215</td> <td>0,210</td> </tr> </table>	0,245	0,315	0,195	0,225	0,255	0,230	0,265	0,270	0,215	0,210	
0,245	0,315	0,195	0,225	0,255								
0,230	0,265	0,270	0,215	0,210								
Q.2.3	The average height of 12 seedlings is 6cm. The total height of 10 of the seedlings is 60cm. Of the two remaining seedlings, the first seedling is double the height of the second seedling. Give the individual heights of these two seedlings.	(4)										

Question 3

3.1

- **Apply the rules of exponents** to answer the exponent problems.
- Module Manual reference: Learning Unit 1. Page 28.

IMPORTANT RULES:

- When you have an exponent expression that is raised to a power, you multiply the exponent and the power. See example b and d on page 28.
- When dividing exponent expressions with the same base you subtract the exponents.

3.2

- **Approximate or round off** the number to the specified decimal place or significant figure.
- Module Manual reference: Learning Unit 1. Page 29.

ROUNDING OFF: DECIMAL PLACES

1. Go to the value at the x-th decimal place.
2. Look at the value immediately to the right of the value at the x-th decimal place:
 - ≥ 5 , add one to the value and drop all numbers to the right of the value
 - ≤ 4 , leave the value as it is and drop all numbers to the right of the value.

Question 3		(Marks: 10)
Q.3.1	Determine the answers to the following exponent problems:	
Q.3.1.1	13356^0	(2)
Q.3.1.2	$(y^7z^6)^5$	(2)
Q.3.1.3	$\left(\frac{x^{-3}}{z^9}\right)^{-5}$	(3)
Q.3.2	Round 143,367293619 to five decimal places.	(1)
Q.3.3	Give the number 1 274 229 to four significant figures.	(1)
Q.3.4	Give the number 0,0004357 to three significant figures.	(1)

ROUNDING OFF: SIGNIFICANT FIGURES

1. Go to the value at the x-th position from the left-hand side, starting with the first non-zero figure.
2. Look at the value immediately to the right of the value at the x-th position:
 - ≥ 5 , add one to the value and **give a value of zero** to all numbers to the right of the value.
 - ≤ 4 , leave the value as it is and **give a value of zero** to all numbers to the right of the value.

Question 4

Q4.1

Q4.1.1

- Calculate the **percentage amount**.
- Module Manual reference: Learning Unit 1. Page 32.

To compute X% of Y:

$$\frac{X}{100} \times Y$$

Q4.1.2

- Calculate the **percentage rate**.
- Module Manual reference: Learning Unit 1. Page 31.

To express X as a % of Y:

$$\frac{X}{Y} \times 100$$

Q4.1.3

- Calculate the **base amount**.
- Module Manual reference: Learning Unit 1. Page 33.

If you are told that X% of an unknown base Y is equal to Z, then Y is called the base amount. To calculate the

base amount:

$$Y = \frac{Z}{X} \times 100$$

Question 4

(Marks: 10)

Q.4.1	Determine the answers to the following percentage problems:	
Q.4.1.1	What is 78% of 506?	(1)
Q.4.1.2	What is 204 as a percentage of 391?	(1)
Q.4.1.3	What is the value of x, if 27% of x is 3996?	(2)
Q.4.2	A car is travelling at 95km/h and then increases its speed to 125km/h. What is the percentage increase in speed?	(2)
Q.4.3	An uncapped fibre contract originally cost R690 per month. It has now fallen in price to R465 per month. What is the percentage decrease in the monthly price of the contract?	(2)
Q.4.4	Your gross salary per month is R27 000. In total, all deductions, including tax, constitute 31% of your gross salary. How much of your gross salary is left after these deductions?	(2)

Question 4

Q4.2

- Calculate the **percentage rate of change (increase)**.
- Module Manual reference: Learning Unit 1. Page 33.
- See question 13 (a) of 14.1 Revision Exercise 1 on page 47 of the Module Manual.

Q4.3.

- Calculate the **percentage rate of change (decrease)**.
- Module Manual reference: Learning Unit 1. Page 33.
- See question 13 (b) of 14.1 Revision Exercise 1 on page 47 of the Module Manual.

$$\text{Percentage rate of change} = \frac{\text{New} - \text{Old}}{\text{Old}} \times 100$$

Q4.4

- **Subtract the percentage amount** from the base value.
- Module Manual reference: Learning Unit 1. Page 34.
- See question 13 (d) of 14.1 Revision Exercise 1 on page 47 of the Module Manual.

To subtract X% of Y from Y:

$$(100 - X)\% \times Y$$

Question 4		(Marks: 10)
Q.4.1	Determine the answers to the following percentage problems:	
Q.4.1.1	What is 78% of 506?	(1)
Q.4.1.2	What is 204 as a percentage of 391?	(1)
Q.4.1.3	What is the value of x , if 27% of x is 3996?	(2)
Q.4.2	A car is travelling at 95km/h and then increases its speed to 125km/h. What is the percentage increase in speed?	(2)
Q.4.3	An uncapped fibre contract originally cost R690 per month. It has now fallen in price to R465 per month. What is the percentage decrease in the monthly price of the contract?	(2)
Q.4.4	Your gross salary per month is R27 000. In total, all deductions, including tax, constitute 31% of your gross salary. How much of your gross salary is left after these deductions?	(2)

Question 5

Question 5 relates to sharing in accordance with a ratio. In business, we often encounter instances where ratios are used to share wealth, costs, assets, or debts. In partnerships, for instance, the partners must decide how they will divide the profits. This is often referred to as the profit-sharing ratio.

5.1

- Determine the **profit-sharing ratio** and use this to **calculate each friend's share of the profit**.
- Refer to question 14 of 14.1 Revision Exercise 1 on page 47 of the Module Manual.

5.2

- Refer to question 15 of 14.1 Revision Exercise 1 on page 47 of the Module Manual.

Question 5		(Marks: 10)
Q.5.1	Three friends decide to start a business. Jill contributes R70 000 to start-up capital, while Vusi contributes R50 000 and Letitia contributes R30 000. They agree to share any profits that the business makes in the same ratio as their respective contributions to start-up capital.	
Q.5.1.1	If the business made a profit of R86 000 in its first year of operation, how much is each friend's share of the profit?	(4)
Q.5.1.2	If Letitia's share of the profit made by the business in its second year of operation is R50 000, what is the total profit made by the business that year?	(4)
Q.5.2	In a two-year training course, there are eleven first year students for every four students in second year. If there are 84 second year students, how many students are there in first year?	(2)

Let's look at an example. . .

Example relating to Q5 of Assignment 1:

Three friends decide to start a business. Molly contributes R50 000 to start-up capital, while Zinhle contributes R40 000 and Serena contributes R30 000. They agree to share any profits that the business makes in the same ratio as their respective contributions to start-up capital.

- a) If the business made a profit of R36 000 in its first year of operation, how much is each friend's share of the profit?
- b) If Molly's share of the profit made by the business in its second year of operation is R40 000, what is the total profit made by the business that year?

Question 6

6.1

- Use **substitution** to solve this question.
- Module Manual reference: Learning Unit 2. Page 53.

6.2

- **Expand** the brackets.
- Module Manual reference: Learning Unit 2. Page 53

6.3

- **Factorise** the expression.
- Module Manual reference: Learning Unit 2. Page 53.

Q6.4.1

- **Simplify** using your knowledge of **exponents**.
- Module Manual reference: Learning Unit 2, examples c) on page
- See question 4 c) in 10.1 Activity 1 on page 63 of the Module Ma

Q6.4.2

- **Simplify** by **factorising** the algebraic expression.
- Module Manual reference: Learning Unit 2, examples e) on page 54.
- See question 4 e) in 10.1 Activity 1 on page 63 of the Module Manual.

Question 6		(Marks: 10)
Q.6.1	Solve $x^2 + 6x - 3$ for $x = -4$	(2)
Q.6.2	Expand the brackets for the following algebraic expression: $4a^2b(5ab^3 + 3a^3b^5)$	(2)
Q.6.3	Factorise the following algebraic expression: $8ab^2 + 4a^2b$	(2)
Q.6.4	Simplify the following.	
Q.6.4.1	$\frac{64x^5y^3}{4xy^2}$	(2)
Q.6.4.2	$\frac{y^3 - y^2}{8y^2 - 8y}$	(2)

Divide the numbers, subtract the exponents.

Note: you cannot subtract the exponents because of the difference (-) within the brackets. Hence, you need to factorise 1st.

Question 7

7.1.1 and 7.1.2

- **Solve** for x (i.e., determine the value of x).
- Module Manual reference: Learning Unit 2. Page 5.

7.1.3

- **Expand** the brackets and solve for x .
- Module Manual reference: Learning Unit 2. Page 5.

7.2

- **Change the subject** of the formula to n .
- Module Manual reference: Learning Unit 2. Page 5.

7.3

- **Change the subject** of the formula to x .
- Module Manual reference: Learning Unit 2. Page 57.
- See 6 d) of 10.1 Activity 1 on page 64 of the Module Manual.

Question 7		(Marks: 10)
Q.7.1	Solve the following algebraic problems:	
Q.7.1.1	$5 + x = 11$	(2)
Q.7.1.2	$\frac{x}{9} = 18$	(2)
Q.7.1.3	$6(3x - 4) = 66$	(2)
Q.7.2	Make n the subject of the following formula: $F = P(1 + in)$	(2)
Q.7.3	Make x the subject of the following formula: $r = \frac{4x + 2}{s}$	(2)

Question 8

- **Solve the inequalities.**
- Refer to the rules for solving inequalities in Learning Unit 2, page 58.

Inequality Rules

The rules for solving algebraic problems apply, with the addition of the following: **multiplying or dividing both sides of an inequality by a negative number changes the direction of the inequality sign.**

Note: the sign does NOT change when you multiply or divide by a positive number.

Question 8

(Marks: 10)

Q.8.1 Solve the following algebraic inequalities:			
Q.8.1.1	$4x \geq 18 + x$		(3)
Q.8.1.2	$(-5x + 6) - 13 \leq 3(7 - x)$		(3)
Q.8.1.3	$-5(z^2 + 3y + x) > -15y - 5z^2 + 40$		(4)

Question 9

- **Determine the linear equation** ($y = mx + c$) for the lines going through the given coordinates.
- Module Manual Reference: Learning Unit 2. Pages 59 – 60.
- See question 8 of 10.1 Activity 1 on page 66 of the Module Manual.

Steps to Determine a Linear Function/Equation:

Step 1: Determine the gradient (m):

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Step 2: Calculate the y-intercept, c , by adding your calculated m to the linear equation and then substitute in an x and corresponding y from one of the given coordinates.

Step 3: Plug in your calculated m and c for the full linear equation.

Question 9		(Marks: 10)
Q.9.1	Determine the linear equation for the line that goes through the following coordinates:	
Q.9.1.1	(0, 6) and (4, 18)	(5)
Q.9.1.2	(1, 10) and (3, 6)	(5)

Remember: coordinates are always in the form $(x; y)$.

Let's look at an example. . .

Determine the linear function of the line that goes through the coordinates $(-1; 4)$ and $(2; 10)$.

Question 10

- **Solve the simultaneous equations** using the process of **elimination**.
- Module Manual reference: Learning Unit 2. Page 61. Section 8.3: *Solving Simultaneous Equations using Elimination*.
- See Q9 in 10.1 Activity 1 on page 66 of the Module Manual.

Solving Simultaneous Equations using Elimination

1. Multiply one or both equations until the coefficients in front of the x or the y in both equations are the same.
2. Add (or subtract) the equations from one another in such a way that one of the unknown variables is eliminated.
3. Solve for the remaining unknown variable.
4. Substitute the value obtained for this variable into one of the equations and solve for the remaining unknown.

Question 10		(Marks: 10)
Q.10.1	Obtain the values of x and y for each of the following sets of simultaneous equations:	
Q.10.1.1	$4x + 2y = 22$ $6x + y = 23$	(5)
Q.10.1.2	$5x + 3y = 2$ $7x + 2y = -6$	(5)

Let's look at two examples. . .