



251201-001-00-00-KM-05, Fundamentals of
Software Engineering Mathematics, NQF Level 5,
Credits 15

LEARNER WORKBOOK
MODULE FIVE (5)

1.1. Document Version

Document Version	1.0
Date Published	
Publisher	

1.2. Document Change History

Date	Version	Initials	Description
	1.0		

Module #	251201-001-00-00-KM-05
NQF Level	5
Notional hours	150
Credit(s)	Cr 15
Occupational Code	251201
SAQA QUAL ID	119458
Qualification Title	Occupational Certificate: Software Engineer Level-6 (240 Credits).

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Purpose

The main focus of the learning in this knowledge module is to build an understanding of basic mathematical concepts and their application within the software engineering environment.

The learning will enable learners to demonstrate an understanding of:

- KM-05-KT01: Basic Algebra (20%)
- KM-05-KT02: Analytical Geometry (5%)
- KM-05-KT03: Calculus (20%)
- KM-05-KT04: Exponents and Logarithms (5%)
- KM-05-KT05: Basic statistics and probability (25%)
- KM-05-KT06: Equations and graphs (10%)
- KM-05-KT07: Linear Programming (10%)
- KM-05-KT08: Inequalities (5%)

Entry Requirements

- NQF Level 4

Or

- Information Communication Technology related qualification

Or

- At least three years' experience in Software Development

Provider Accreditation Requirements for the Knowledge Module

Physical Requirements:

- Well-resourced, ventilated and illuminated training centre with adequate facilities in accordance with industry general practices including but not limited to: -
- A desk and chair for each learner
- Hygiene facilities with adequate capacity and privacy
- Fully functional Computer Laboratory with access to the internet
- Relatively current and relevant software

Human Resource Requirements:

- Facilitator / Learner ratio of not more than 1:25
- Facilitators should hold an ICT related qualification pertaining to software development
- Facilitators must have a minimum 2 years' relevant facilitation or work experience

Or

- Facilitators must have completed a facilitator course

Legal Requirements:

- Compliant with the relevant Legislations

Venue, Date and Time:

- Consult your facilitator should there be any changes to the venue, date and/or time.
- Refer to your timetable.

Assessments

Integrated Formative Assessment: The skills development provider will use the curriculum to guide them on the stipulated internal assessment criteria and weighting. They will also apply the scope of practical skills and applied knowledge as stipulated by the internal assessment criteria. This formative assessment leads to entrance into the integrated external summative assessment.

Integrated Summative Assessment: The external summative assessment will be conducted through integrated written exercises and evaluation of a project and/or assignment by registered assessors at accredited assessment centres. Integrated written assessment will be conducted within a day. Candidates will be given a project to develop a solution over a period of three weeks. The project will be presented to a panel of assessors for a maximum of 3 hours. The overall summative assessment, which includes presentation of the project as well as written assessment, will take place over 2 days.

PURPOSE OF THE QUALIFICATION

The purpose of this qualification is to prepare a learner to operate as a Software Engineer. A Software Engineer researches, analyses and evaluates requirements for existing or new software applications and designs, develops, deploys, tests within scope of work(debugs) and maintains software applications.

A qualified learner will be able to:

- Design software to meet clients' needs, (NQF Level 6)
- Design and manipulate databases, (NQF Level 6)
- Develop software to add value to the organisation, (NQF Level 6)
- Test or debug source code to ensure client's needs are met, (NQF Level 5)

QUALIFICATION RULES

This qualification is made up of the following compulsory Knowledge and Practical Skill Modules:

Knowledge Modules:

- 251201-001-00-00-KM-01, Software Engineering, NQF Level 6, Credits 20
- 251201-001-00-00-KM-02, Programming, NQF Level 6, Credits 20
- 251201-001-00-00-KM-03, Database design and Information Systems, NQF Level 6, Credits 15
- 251201-001-00-00-KM-04, Fundamentals of Project Management in relation to Software Engineering, NQF Level 5, Credits 5
- 251201-001-00-00-KM-05, Digital and Business Mathematics, NQF Level 5, Credits 15

Total number of credits for Knowledge Modules: 75

Practical Skill Modules:

- 251201-001-00-00-PM-01, Document system design, NQF Level 6, Credits 25
- 251201-001-00-00-PM-02, Design and Manipulate Databases, NQF Level 5, Credits 5
- 251201-001-00-00-PM-03, Program and deploy applications, NQF Level 6, Credits 25
- 251201-001-00-00-PM-04, Test or debug source code to ensure client's needs are met, NQF Level 5, Credits 15

Total number of credits for Practical Skill Modules: 70

Work Experience Modules:

- 251201-001-00-00-WM-01, Software design, NQF Level 6, Credits 30
- 251201-001-00-00-WM-02, Database design and manipulation, NQF Level 5, Credits 20
- 251201-001-00-00-WM-03, Software development, NQF Level 6, Credits 30
- 251201-001-00-00-WM-04, Software testing, NQF Level 5, Credits 15

Total number of credits for Work Experience Modules: 95

EXIT LEVEL OUTCOMES

1. Design software to meet clients' needs
2. Design and manipulate databases
3. Develop software to add value to the organisation
4. Test or debug source code

KM-01-KT01: 05-KT01: Basic Algebra (20%)

1. Find the union or the intersection of two groupings making use of diagrams in relation to programming

To Find the union of two sets, And the intersection.

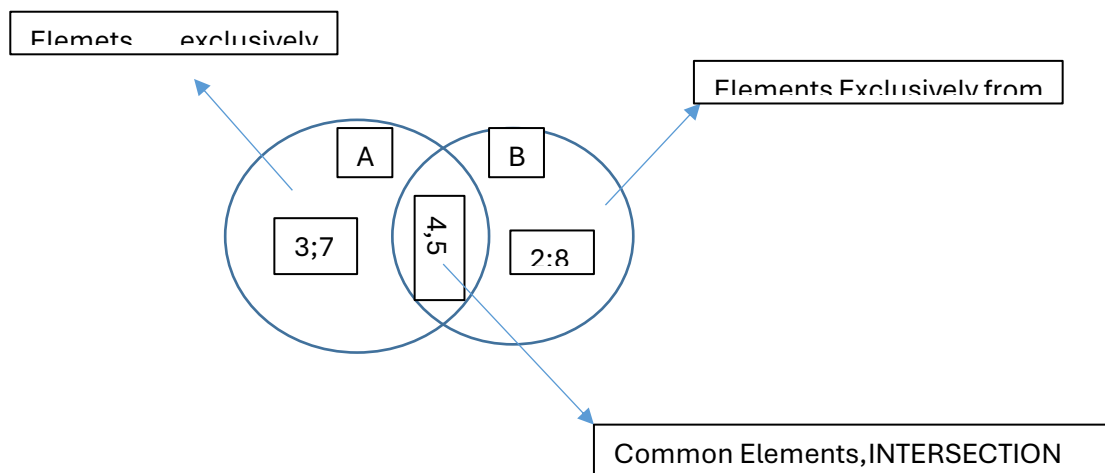
Write down the two sets

$$A = \{3,4,5,7\}$$

$$B = \{2,4,5,8\}$$

Notice that we have Common Elements.4,5

Now make use of a Venn diagram to get a visual of what's going on.



Too draw the diagram..write down all the Common Elements,

Draw your two circles intersecting each other, Name them ,Now put the Common elements inside the part where the two circles intersect. Now put all elements from list A in the circle of A, Now remove the elements that appears more than once, Do the same with B and you have your Diagram,

We can now read our data from the diagram.

The union will be all the elements shown in the diagram

$$A \cup B = \{2, 3, 4, 5, 7, 8\}$$

The intersection will be the elements in the middle (The common elements)

$$A \cap B = \{4, 5\}$$

This is the correct format for writing the Intersection of two sets



This is the correct format for writing the Union of two sets



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John Herbst

Student Name and Surname: _____

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- Explain the role played by sequence and series investments and how these are applied in finance.

Sequence and series investments describes money that is invested or received at regular intervals over time. In financing they help to calculate the future value or present value of repeated payments, such as instalments, loan repayments, annuities, retirement savings, and bond interest payments. A sequence represents each individual payment, while a series represents the total of all those payments over the whole investment period. These concepts are applied to determine how investments grow with compound interest, to compare different financial products to make informed financial decisions.

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2. Solve the following

a. Convert each decimal to a percent.

- $0.25 = 25\%$
- $0.36 = 36\%$
- $0.48 = 48\%$
- $0.343 = 34.3\%$
- $0.771 = 77.1\%$
- $1.42 = 142\%$
- $2.58 = 258\%$
- $4.976 = 497.6\%$
- $16.1814 = 1618.14\%$
- $533.01 = 53301\%$
- $2 = 200\%$
- $14 = 140\%$

b. Convert each percent to a decimal.

- $15\% = 0.15$
- $43\% = 0.43$
- $16.2\% = 0.162$
- $53.8\% = 0.538$
- $5.05\% = 0.0505$
- $6.11\% = 0.0611$
- $0.78\% = 0.0078$
- $0.88\% = 0.0088$
- $0.09\% = 0.0009$

- $0.001\% = 0.000001$

c. Convert each fraction to a percent.

- $\frac{1}{5} = 20\%$
- $\frac{3}{5} = 60\%$
- $\frac{5}{8} = 62.5\%$
- $\frac{1}{16} = 6.25\%$
- $\frac{7}{25} = 28\%$
- $\frac{16}{45} = 42.22218\%$
- $\frac{27}{55} = 49.0887\%$
- $\frac{15}{8} = 187.5\%$
- $\frac{41}{25} = 164\%$

d. Convert each percent to a fraction.

- $80\% = \frac{4}{5}$
- $60\% = \frac{3}{5}$
- $25\% = \frac{1}{4}$
- $75\% = \frac{3}{4}$
- $65\% = \frac{13}{20}$
- $18\% = \frac{9}{50}$
- $12.5\% = \frac{1}{8}$
- $37.5\% = \frac{3}{8}$
- $512.5\% = \frac{41}{8}$

- $937.5\% = 35/8$
- $9.9\% = 9.9/100$
- $55.5\% = 11.1/20$

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KM-05-KT02: Analytical Geometry (5%)

3. Find the angle between two points

Lets start with the two points.

a(2,4) and b(6,7)

To find the angle we will need the gradient.

$$m = (a)y - (b)y / (a)x - (b)x$$

$$m = 4 - 7 / 2 - 6$$

$$-3 / -4$$

This will give us 0.75

Now we can work out the angle by using $\text{TAN}^{-1}(m)$

So all we do is $\text{TAN}^{-1}(0.75)$

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KM- 05-KT03: Calculus (20%)

4. Find the rate of change

$$m = \frac{(a)y - (b)y}{(a)x - (b)x}$$

$a(2,4)$ and $b(4,7)$

$$m = (7-4) / (4-2)$$

$$m = 3/2$$

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KM-05- KT05 Basic Statistics and probability (25%)

5. Find probability of a given problem.

Given the following

$$P(A) = 0.4$$

$$P(B) = 0.5$$

$$P(A \cap B) = 0.2$$

Determine $P(A \cup B)$ using the probability formula.

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A \cup B) = 0.4 + 0.5 - 0.2$$

$$P(A \cup B) = 0.7$$

Determine $P(A \cup B)'$

$$P(A \cup B)' = 1 - P(A \cup B) = 1 - 0.7 = 0.3$$

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- Based on the given sample, test the hypothesis about the population.

A factory has a machine that dispenses 80mL of fluid in a bottle .An employee belives the average amount of fluif is not 80mL .Using 40 samples ,he measures the average amount dispensed by the machine to be 78ml with a standard deviation of 2.5

- State the null and alternative hypotheses
- At 95% confidence level,is there enough evidence to support the idea that the machine is not working properly?

Answer

a) $H_0 = 80\text{mL}$ $H_a = \text{not } 80\text{mL}$ $\bar{x}=78$ $s=2.5$ $n=40$



$$Z = \frac{\bar{x} - \mu_0}{s / \sqrt{n}}$$

$$= \frac{78 - 80}{2.5 / \sqrt{40}}$$

$$Z = \frac{-2}{0.39528}$$

$$Z \approx -5.06$$

This means its further left than -1.96

This means the test is not valid

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- Differentiate between qualitative and quantitative data.

In short

Qualitative is words and descriptions.

Quantitative is numbers and measurements.

Qualitative Data

Nature: Descriptive, non-numerical.

Purpose: Helps understand *qualities*, characteristics, opinions, or experiences.

Examples: Colors, textures, interview responses, emotions, categories like “satisfied” or “not satisfied.”

How it’s collected: Interviews, open-ended surveys, observations, focus groups.

Analysis: Thematic analysis, coding, pattern identification.

Quantitative Data

Nature: Numerical, measurable.

Purpose: Helps quantify variables and analyze relationships using statistics.

Examples: Age, height, test scores, number of items sold, temperature.

How it’s collected: Experiments, closed-ended surveys, measurements, sensors.

Analysis: Statistical analysis (means, percentages, correlations, hypothesis testing).

If you just analysed quantitative data, you’d be missing core reasons behind what makes a data collection meaningful. You need both in order to truly learn from data—and truly learn from your customers

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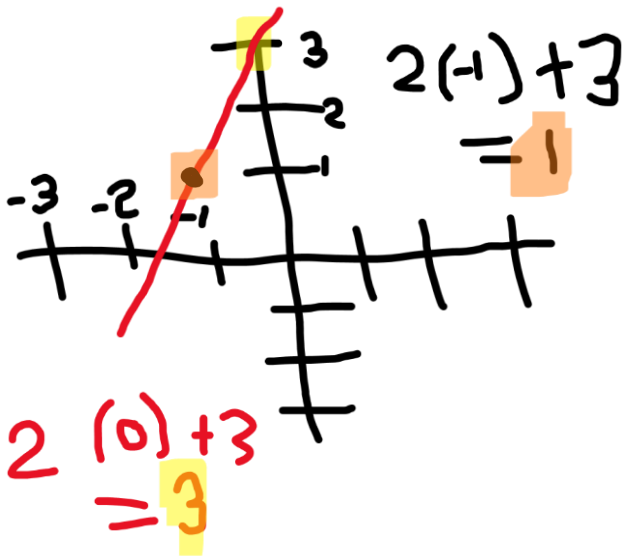


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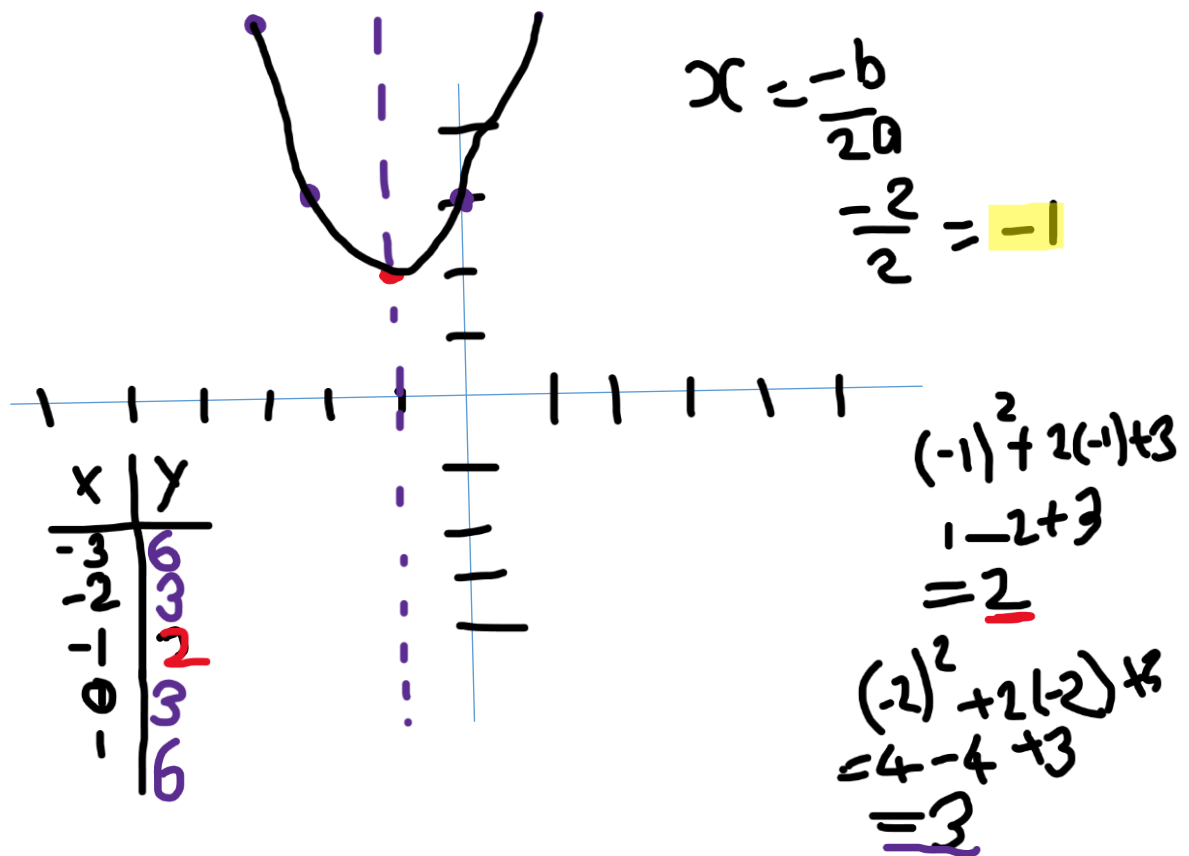
KM- 05-KT06: Equations and graphs (10%)

- Plot the graphs of given equations

$$Y=2x+3$$



$$Y = x^2 + 2x + 3$$



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KM-05-KT08: Inequalities (10%)

- Solve inequalities of a given problem

$$2x+3>7$$

$$\begin{array}{r} 2x+3 > 7 \\ \quad \quad -3 \quad \quad -3 \\ \hline 2x > 4 \\ \quad \quad \div 2 \quad \quad \div 2 \\ \hline x > 2 \end{array}$$

$$x^2 - x \geq 12$$

$$x^2 - x \geq 12$$

$$\begin{array}{r} -12 \\ -4 \quad 3 \end{array}$$

$$x^2 - x - 12 \geq 0$$

$$(x-4)(x+3) \geq 0$$

$$x = -4 \quad x = -3$$

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