

7.2 Design

Syllabus 2026 - 2028

WHAT YOU NEED TO KNOW

- Designing file and data structures, input formats, output formats and validation routines
- File structures: field length, field name, data type and coding of data
- Validation routines: range, character, length, type, format, presence and check digit
- Input formats, including data capture forms
- Output formats, including screen layouts and report layouts

In the **design** stage, the analyst plans how the new system will work, using the requirements found in the analysis. The design covers the data to be stored, how data is entered, how results are shown, and how errors are prevented.

File and data structures

A **field** holds one item of data (such as a surname). A **record** is all the fields about one person or thing. A **file** (or table) is a collection of records. The designer decides, for each field, its name, data type, length and any coding.

Field name	Data type	Field length	Example / coding
StudentID	Text (alphanumeric)	6	S10234
Surname	Text	20	Dlamini
DateOfBirth	Date	10	14/03/2010 (DD/MM/YYYY)
Gender	Text, coded	1	M for male, F for female
FeesPaid	Boolean	1	Yes or No
Balance	Currency	8	E 450.00

- **Field name:** a short, clear name that describes the data
- **Data type:** the kind of data: text, numeric (integer or real), date or time, Boolean (yes or no) or currency. The correct type allows correct sorting and calculation
- **Field length:** the maximum number of characters. It must be long enough for the longest value, but not too long, or storage is wasted
- **Coding of data:** using a short code in place of a longer value, such as M and F for male and female. Coding saves storage space, makes entry quicker, reduces typing errors and makes validation easier

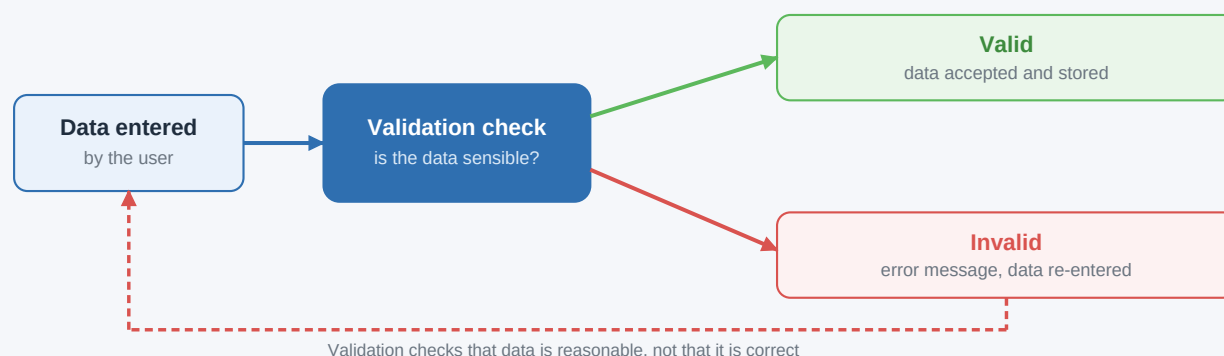
Validation routines

Validation is an automatic check by the computer that the data entered is **reasonable and allowed**. It does not prove the data is **correct**: an age of 15 entered instead of 16 passes a range check.

Check	What it does	Example
Range check	Data is between an upper and a lower limit	Age must be from 11 to 18
Character check	Only allowed characters are used	A name has letters only, with no digits
Length check	Data has the correct number of characters	A phone number must have 8 digits
Type check	Data is of the correct data type	Quantity must be a whole number, not text
Format check	Data follows a set pattern	Date as DD/MM/YYYY; code as two letters then three digits
Presence check	The field has not been left empty	A surname must be entered

Check	What it does	Example
Check digit	An extra digit, calculated from the other digits, is checked when the number is entered. It finds mistyped or swapped digits	The last digit of a barcode or ISBN

Figure 20: How a validation routine works



Input formats

An **input format** shows how data is collected and entered. A **data capture form** is a paper or on-screen form used to collect data. A good form:

- has a clear **title** and instructions
- has labelled **fields** in a logical order, with enough space to write
- uses **boxes for each character**, tick boxes, drop-down lists or radio buttons to limit answers
- shows the **format** to use, for example DD/MM/YYYY
- matches the fields in the file structure, so data can be entered without being changed
- is uncluttered, uses readable fonts and groups related items together

Figure 21: A data capture form

STUDENT REGISTRATION FORM

Student ID: [][][][][][]

Surname: []

Date of birth: [][] / [][] / [][][][]

Gender: ☐ M ☐ F

Class: [] ▼

Signature: []

Annotations:

- Clear title and instructions
- One box for each character
- Date format is shown
- Tick boxes limit the answers
- Drop-down list for fixed choices

Output formats

An **output format** shows how results are presented. This is done with screen layouts and report layouts.

- **Screen layout:** clear headings and labels, consistent fonts and colours, instructions, navigation buttons, and enough white space so that the screen is easy to read
- **Report layout:** a title and date, clear column headings, data lined up in columns, totals where needed, and page numbers
- Design them to match what the users need, and check them with the users

Figure 22: A report layout

Title and date
identify the report

Clear column
headings

Learner Fees Report			
25 October 2026			
ID	Name	Class	Fees
001	Thandi D.	4A	E 450
002	Sipho M.	4A	E 600
003	Lindiwe N.	4B	E 500
004	Bheki S.	4C	E 600
Total			E 2 150

Data lined up
in columns

Total at the
end of the column

Page number
in the footer

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EXAM TIP

Be ready to explain **why** a field needs a particular validation check, for example 'a range check is used on age so that a value such as 150 is rejected'. Remember that validation only checks that data is **reasonable**, never that it is **correct**.

Key terms

Term	Meaning
Design	Planning how the new system will work.
Field	One item of data in a record.
Record	All the fields about one person or thing.
File	A collection of records.
Data type	The kind of data stored in a field.
Coding	Using a short code in place of a longer value.
Validation	An automatic check that data is reasonable.
Check digit	An extra digit used to detect errors in a number.
Data capture form	A form used to collect data.
Screen layout	How output is arranged on screen.
Report layout	How output is arranged in a printed report.

Practice questions

Answer each question in full sentences. Command words used: State (give a short answer), Describe (say what it is like), Explain (give reasons), Analyse (break it down and examine it), Suggest (apply your knowledge to a situation), Compare and contrast (similarities and differences), Evaluate (weigh up and reach a judgement).

No.	Question	Marks
1	State two data types that could be used in a file structure.	[2]
2	State two features of a well-designed data capture form.	[2]
3	Describe how a check digit is used to find an error in a number.	[3]
4	Explain why gender might be coded as M and F in a file.	[2]
5	Analyse why the design of a report layout is important to the person reading it.	[3]
6	Suggest three validation checks for a field that stores a learner's date of birth.	[3]
7	Compare and contrast a length check with a format check.	[4]
8	Evaluate the use of validation routines in a school database.	[5]

Total: 24 marks