01 Data Representation

SrWL Learning · Complete Classroom Teaching Version · 2026–2028 target

Numbers, text, images and sound

55 editable slides / Explanation · Visual · Practice · Teacher Check

By the end of this chapter

- Number systems.
- Binary arithmetic.
- Characters and images.
- Sound and compression.

Learning goals are organised into bite-sized lessons.

Our learning route

10 mini-lessons · each includes one guided check

01 Binary, denary and hexadecimal: A

02 Binary, denary and hexadecimal: B

03 Converting binary numbers: A

04 Converting binary numbers: B

05 Binary arithmetic and overflow: A

06 Binary arithmetic and overflow: B

07 Representing media: A

08 Representing media: B

09 Storage and accuracy: A

10 Storage and accuracy: B

01 Binary, denary and hexadecimal · Foundations

One clear idea to explain before moving to practice

Denary uses base 10: digits 0–9.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Binary, denary and hexadecimal — key points

- Denary uses base 10: digits 0–9.
- Binary uses base 2: digits 0 and 1.

Worked context: Example: $1010\ 1111_2 = AF_{16}$.

Binary, denary and hexadecimal — connect the ideas

Follow the concept from left to right

01

Denary uses base 10: digits 0–9.

→

02

Binary uses base 2: digits 0 and 1.

Apply the principles to this example: Example: $1010\ 1111_2 = AF_{16}$.

Try it · Binary, denary and hexadecimal

Think (30 s) · Pair discussion (1 min) · Share

Explain the meaning of this idea and give a relevant example:

Binary uses base 2: digits 0 and 1.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Binary, denary and hexadecimal

Model response · Correct misconceptions

Binary uses base 2: digits 0 and 1.

EXAM TIP / EXTENSION

Use this worked context to add detail: Example: $1010\ 1111_2 = AF_{16}$.

02 Binary, denary and hexadecimal · Applications

One clear idea to explain before moving to practice

Hexadecimal uses base 16: digits 0–9 and A–F.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Binary, denary and hexadecimal — key points

- Hexadecimal uses base 16: digits 0–9 and A–F.
- One hexadecimal digit represents four binary bits.

Worked context: Example: $1010\ 1111_2 = AF_{16}$.

Binary, denary and hexadecimal — connect the ideas

Follow the concept from left to right

01

Hexadecimal uses base 16: digits 0–9 and A–F.

→

02

One hexadecimal digit represents four binary bits.

Apply the principles to this example: Example: $1010\ 1111_2 = AF_{16}$.

Try it · Binary, denary and hexadecimal

Think (30 s) · Pair discussion (1 min) · Share

Describe when this principle applies:

One hexadecimal digit represents four binary bits.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Binary, denary and hexadecimal

Model response · Correct misconceptions

One hexadecimal digit represents four binary bits.

EXAM TIP / EXTENSION

Use this worked context to add detail: Example: $1010\ 1111_2 = AF_{16}$.

03 Converting binary numbers · Foundations

One clear idea to explain before moving to practice

Read place values from right to left: 1, 2, 4, 8, 16, .

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Converting binary numbers — key points

- Read place values from right to left: 1, 2, 4, 8, 16, .
- Add the place values wherever a binary digit is 1.

Worked context: Example: $1101_2 = 8 + 4 + 1 = 13_{10}$.

Converting binary numbers — connect the ideas

Follow the concept from left to right

01

Read place values from right to left: 1, 2, 4, 8, 16, ...

→

02

Add the place values wherever a binary digit is 1.

Apply the principles to this example: Example: $1101_2 = 8 + 4 + 1 = 13_{10}$.

Try it · Converting binary numbers

Think (30 s) · Pair discussion (1 min) · Share

Identify the key technical terms and describe their roles:
Add the place values wherever a binary digit is 1.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Converting binary numbers

Model response · Correct misconceptions

Add the place values wherever a binary digit is 1.

EXAM TIP / EXTENSION

Use this worked context to add detail: Example: $1101_2 = 8 + 4 + 1 = 13_{10}$.

04 Converting binary numbers · Applications

One clear idea to explain before moving to practice

Convert denary to binary using repeated division by 2.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Converting binary numbers — key points

- Convert denary to binary using repeated division by 2.
- Group binary into four-bit groups for hexadecimal.

Worked context: Example: $1101_2 = 8 + 4 + 1 = 13_{10}$.

Converting binary numbers — connect the ideas

Follow the concept from left to right

01

Convert denary to binary using repeated division by 2.

→

02

Group binary into four-bit groups for hexadecimal.

Apply the principles to this example: Example: $1101_2 = 8 + 4 + 1 = 13_{10}$.

Try it · Converting binary numbers

Think (30 s) · Pair discussion (1 min) · Share

Compare this concept with a related alternative:
Group binary into four-bit groups for hexadecimal.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Converting binary numbers

Model response · Correct misconceptions

Group binary into four-bit groups for hexadecimal.

EXAM TIP / EXTENSION

Use this worked context to add detail: Example: $1101_2 = 8 + 4 + 1 = 13_{10}$.

05 Binary arithmetic and overflow · Foundations

One clear idea to explain before moving to practice

Addition follows 0+0=0, 0+1=1 and 1+1=10.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Binary arithmetic and overflow — key points

- Addition follows 0+0=0, 0+1=1 and 1+1=10.
- A carry bit moves into the next column.

Worked context: Example: $1111_2 + 0001_2 = 10000_2$ (5 bits).

Binary arithmetic and overflow — connect the ideas

Follow the concept from left to right

01

Addition follows 0+0=0, 0+1=1 and 1+1=10.

→

02

A carry bit moves into the next column.

Apply the principles to this example: Example: $1111_2 + 0001_2 = 10000_2$ (5 bits).

Try it · Binary arithmetic and overflow

Think (30 s) · Pair discussion (1 min) · Share

Apply this idea to a new computer science scenario:
A carry bit moves into the next column.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Binary arithmetic and overflow

Model response · Correct misconceptions

A carry bit moves into the next column.

EXAM TIP / EXTENSION

Use this worked context to add detail: Example: $1111_2 + 0001_2 = 10000_2$ (5 bits).

06 Binary arithmetic and overflow · Applications

One clear idea to explain before moving to practice

Overflow occurs when a value exceeds the available bits.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Binary arithmetic and overflow — key points

- Overflow occurs when a value exceeds the available bits.
- Logical and arithmetic shifts change the bit positions.

Worked context: Example: $1111_2 + 0001_2 = 10000_2$ (5 bits).

Binary arithmetic and overflow — connect the ideas

Follow the concept from left to right

01

Overflow occurs when a value exceeds the available bits.

→

02

Logical and arithmetic shifts change the bit positions.

Apply the principles to this example: Example: $1111_2 + 0001_2 = 10000_2$ (5 bits).

Try it · Binary arithmetic and overflow

Think (30 s) · Pair discussion (1 min) · Share

Explain the meaning of this idea and give a relevant example:

Logical and arithmetic shifts change the bit positions.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Binary arithmetic and overflow

Model response · Correct misconceptions

Logical and arithmetic shifts change the bit positions.

EXAM TIP / EXTENSION

Use this worked context to add detail: Example: $1111_2 + 0001_2 = 10000_2$ (5 bits).

07 Representing media · Foundations

One clear idea to explain before moving to practice

Text characters have numeric character codes.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Representing media — key points

- Text characters have numeric character codes.
- Image resolution is measured in pixels; colour depth is bits per pixel.

Worked context: Image size (bits) = width × height × colour depth.

Representing media — connect the ideas

Follow the concept from left to right

01

Text characters have numeric character codes.

→

02

Image resolution is measured in pixels; colour depth is bits per pixel.

Apply the principles to this example: Image size (bits) = width × height × colour depth.

Try it · Representing media

Think (30 s) · Pair discussion (1 min) · Share

Describe when this principle applies:

Image resolution is measured in pixels; colour depth is bits per pixel.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Representing media

Model response · Correct misconceptions

Image resolution is measured in pixels; colour depth is bits per pixel.

EXAM TIP / EXTENSION

Use this worked context to add detail: Image size (bits) = width × height × colour depth.

08 Representing media · Applications

One clear idea to explain before moving to practice

Sound is sampled at a sample rate and sample resolution.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Representing media — key points

- Sound is sampled at a sample rate and sample resolution.
- Compression reduces data size; lossy discards information.

Worked context: Image size (bits) = width × height × colour depth.

Representing media — connect the ideas

Follow the concept from left to right

01

Sound is sampled at a sample rate and sample resolution.

→

02

Compression reduces data size; lossy discards information.

Apply the principles to this example: Image size (bits) = width × height × colour depth.

Try it · Representing media

Think (30 s) · Pair discussion (1 min) · Share

Identify the key technical terms and describe their roles: Compression reduces data size; lossy discards information.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Representing media

Model response · Correct misconceptions

Compression reduces data size; lossy discards information.

EXAM TIP / EXTENSION

Use this worked context to add detail: Image size (bits) = width × height × colour depth.

09 Storage and accuracy · Foundations

One clear idea to explain before moving to practice

Bit = one binary digit; a byte contains eight bits.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Storage and accuracy — key points

- Bit = one binary digit; a byte contains eight bits.
- File-size calculations must use consistent units.

Worked context: Practice: 100 × 80 image at 8 bits per pixel = 64,000 bits.

Storage and accuracy — connect the ideas

Follow the concept from left to right

01

Bit = one binary digit; a byte contains eight bits.

→

02

File-size calculations must use consistent units.

Apply the principles to this example: Practice: 100 × 80 image at 8 bits per pixel = 64,000 bits.

Try it · Storage and accuracy

Think (30 s) · Pair discussion (1 min) · Share

Compare this concept with a related alternative:
File-size calculations must use consistent units.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Storage and accuracy

Model response · Correct misconceptions

File-size calculations must use consistent units.

EXAM TIP / EXTENSION

Use this worked context to add detail: Practice: 100 × 80 image at 8 bits per pixel = 64,000 bits.

10 Storage and accuracy · Applications

One clear idea to explain before moving to practice

Higher image colour depth supports more colours.

TEACHER EXPLANATION

Discuss why this principle matters in real computer systems.

Storage and accuracy — key points

- Higher image colour depth supports more colours.
- Higher sample rate can increase sound fidelity and file size.

Worked context: Practice: 100 × 80 image at 8 bits per pixel = 64,000 bits.

Storage and accuracy — connect the ideas

Follow the concept from left to right

01

Higher image colour depth supports more colours.

→

02

Higher sample rate can increase sound fidelity and file size.

Apply the principles to this example: Practice: 100 × 80 image at 8 bits per pixel = 64,000 bits.

Try it · Storage and accuracy

Think (30 s) · Pair discussion (1 min) · Share

Apply this idea to a new computer science scenario:
Higher sample rate can increase sound fidelity and file size.

YOUR TASK

Use accurate technical vocabulary. Add a second point or a specific example where possible.

Teacher check · Storage and accuracy

Model response · Correct misconceptions

Higher sample rate can increase sound fidelity and file size.

EXAM TIP / EXTENSION

Use this worked context to add detail: Practice: 100 × 80 image at 8 bits per pixel = 64,000 bits.

Five essential ideas

Recall these without looking at the teaching slides

01 Binary, denary and hexadecimal

02 Converting binary numbers

03 Binary arithmetic and overflow

04 Representing media

05 Storage and accuracy

End-of-chapter challenge

Answer in your notebook, then compare with a partner

Convert 101101_2 to denary, then to hexadecimal.

TEACHER MODEL ANSWER

45_{10}; $2D_{16}$.