

# Units

**Warm-Up**

Find the five units that measure data and order them in increasing size.

|   |     |          |     |      |          |         |       |        |        |
|---|-----|----------|-----|------|----------|---------|-------|--------|--------|
| HEX   | BIT | PETABYTE | TIB | BYTE | KILOBYTE | BOOLEAN | MUNCH | BINARY | NIBBLE |
| .....   |     |          |     |      |          |         |       |        |        |
| smallest <span style="float: right;">→ largest</span> |     |          |     |      |          |         |       |        |        |

1 Misha wants to save some music files onto a solid state drive (SSD).

a) State which SSD has the largest capacity:

250 gigabyte (GB), 200 000 megabyte (MB) or 0.3 terabyte (TB).

.....  
[1]

b) Calculate how many 5 MB music files Misha could save onto a 250 GB SSD.

.....  
[2]

[Total 3 marks]

2 Computers process data in binary code and often use check digits.

a) Outline what is meant by a check digit.

.....  
.....  
[2]

b) Describe how binary is used to represent data in computers.

.....  
.....  
[2]

c) An even parity bit has been added to the end of three 7-bit binary codes to create the 8-bit binary codes below. Identify and explain which code contains an error.

**Code 1**  
10101011

**Code 2**  
10100101

**Code 3**  
10010011

.....  
.....  
[2]

d) Explain how a binary code containing a parity bit can be read incorrectly without any errors being detected.

.....  
.....  
[2]

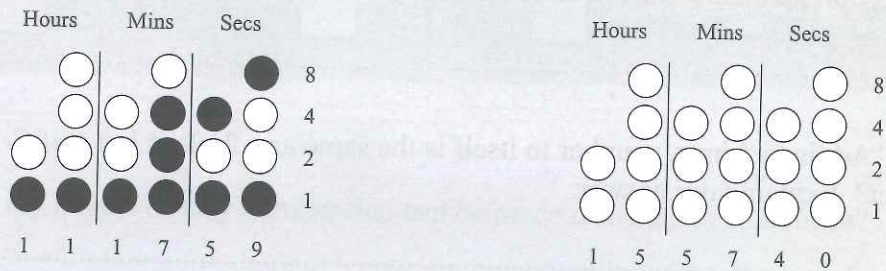
[Total 8 marks]



# Binary Numbers

**Warm-Up**

Black dots on the first binary clock below indicate the time 11:17:59. Shade the dots on the second clock to show the time 15:57:40.



1 Work out these conversions.

a) Convert the 8-bit binary number 10010011 into a denary number.

.....  
[1]

b) Convert the denary number 252 into an 8-bit binary number.

.....  
[1]  
[Total 2 marks]

2 An 8-bit binary addition involves adding two 8-bit numbers and getting an 8-bit answer.

a) Add the binary numbers 00111001 and 01010110.

.....  
[2]

b) Computers can encounter overflow when adding binary numbers.

i) Give an example of an 8-bit binary addition where an overflow occurs.

[2]

ii) Explain how a computer deals with the overflow.

.....  
.....

[2]

[Total 6 marks]

3 Binary shifts can be used to quickly multiply and divide binary numbers.

a) Complete a 3 place left shift on the binary number 00011010.

.....  
[1]

b) State an appropriate binary shift to divide a binary number by 4 and use it on 11010100.

.....  
[2]

c) Yasha says "Adding a binary number to itself is the same as a 2 place left shift." Is he correct? Explain your answer.

.....  
.....  
[2]

[Total 5 marks]

4 In a video game, every 8-bit binary number represents a unique magic word or a spell. The last digit determines if it is a magic word (0) or a spell (1).

a) State how many unique magic words there are.

.....  
[1]

Spells are made by adding the binary numbers of words together and then adding 00000001. Overflow bits are ignored. A sample of spells and words are shown below.

| Number   | Word    |
|----------|---------|
| 00110100 | Shazam  |
| 01010000 | Abra    |
| 01100110 | Kadabra |
| 10011100 | Hocus   |
| 11001010 | Pocus   |

| Number   | Spell      |
|----------|------------|
| 00100011 | Teleport   |
| 01101111 | Fireball   |
| 10110111 | Blizzard   |
| 11110001 | Zap        |
| 11111111 | Earthquake |

Because the last digit is always 0, this is the same as changing the last digit from a 0 to a 1.

b) What spell is made with the words 'Abra' and 'Kadabra'?

.....  
[2]

c) Identify **two** words from the table that could have been used to make the Earthquake spell.

..... and .....

[Total 5 marks]

**Exam Practice Tip**

If you end up with too many bits after some 8-bit binary arithmetic and don't know what to do you could be giving away some easy marks! Make sure you use the technical term for this, **overflow**, and can explain it clearly.



# Hexadecimal Numbers

**Warm-Up**

Fill in the boxes below to complete the hexadecimal equations.

A +  = C      6 +  = E       + 6 = C      F +  = 1E

1 Work out these hexadecimal problems.

Remember — no calculators allowed.

a) What is the largest denary number that can be made using 2 hex characters?

.....  
[1]

b) Convert the hexadecimal number 37 into denary.

.....  
[2]

c) Convert the denary number 45 into hexadecimal.

.....  
[2]

[Total 5 marks]

2 A security program encrypts passwords using a hexadecimal conversion.

The binary code of each letter for the password 'CAT' is shown below.

01000011 01000001 01010100

a) Convert each binary number above to a hexadecimal number to encrypt the password 'CAT'.

.....  
[3]

b) The password 'DOG' is encrypted as 44 4F 47.

i) Convert the first encrypted letter to binary.

.....  
[1]

ii) What password would be encrypted as 43 4F 44 45?

Hint: Look back at previous question parts.

.....  
[2]

[Total 6 marks]

# Hexadecimal Numbers

## Warm-Up

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a) What is the largest denary number that can be made using 2 hex characters?

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[2]

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[2]

[Total 5 marks]

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[Total 6 marks]