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 → largest

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	Code 2	Code 3
10101011	10100101	10010011

.....

.....

[2]

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

.....

.....

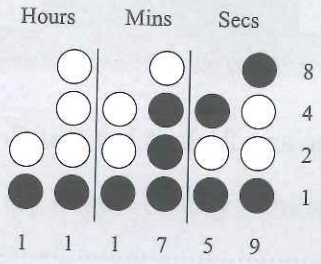
[2]

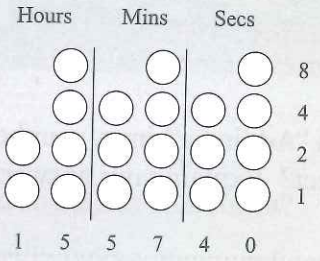
[Total 8 marks]

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 .....

[2]

[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]

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