Binary -> Decimal------------------------------------------------------

1. **1011**
2. **1011 1010**
3. **0001 1111 1010**
4. **0110 1010 0001**

1 0 1 1

= 1 \* 23 = 8 + 0 \* 22 = 0 + 1 \* 21 = 2 + 1 \* 20 = 1

= 8 + 2 + 1

= **11**

1 0 1 1 1 0 1 0

= 1 \* 27 = 128 + 0 \* 26 = 0 + 1 \* 25 = 32 + 1 \* 24 = 16

* 1 \* 23 = 8 + 0 \* 22 = 0 + 1 \* 21 = 2 + 0 \* 20 = 0

= 128 + 32 + 16 + 8 + 2

= **186**

0 0 0 1 1 1 1 1 1 0 1 0

= 0 \* 211 = 0 + 0 \* 210 = 0 + 0 \* 29 = 0 + 1 \* 108 = 256

* 1 \* 27 = 128 + 1 \* 26 = 64 + 1 \* 25 = 32 + 1 \* 24 = 16
* 1 \* 23 = 8 + 0 \* 22 = 0 + 1 \* 21 = 2 + 0 \* 20 = 0

= 256 + 128 + 64 +32 + 16 + 8 + 2

= **506**

0 1 1 0 1 0 1 0 0 0 0 1

= 0 \* 211 = 0 + 1 \* 210 = 1024 + 1 \* 29 = 512 + 0 \* 108 = 0

* 1 \* 27 = 128 + 0 \* 26 = 0 + 1 \* 25 = 32 + 0 \* 24 = 0
* 0 \* 23 = 0 + 0 \* 22 = 0 + 0 \* 21 = 0 + 1 \* 20 = 1

= 1024 + 512 + 128 + 32 + 1

= **1697**

Decimal -> Binary------------------------------------------------------

1. **7**
2. **18**
3. **343**
4. **1562**

23 = 8 which is too big since 8 > 7 so we start subtracting with 22

7 - 22 = 7 - 4 = 3 3 ≥ 21 = 3 ≥ 2 = TRUE so next is 21

3 - 21 = 3 - 2 = 1 1 ≥ 20 = 1 ≥ 1 = TRUE so next is 20

1 - 20 = 1 - 1 = 0 Since we hit zero, we stop.

Place a 1 in each spot where we subtracted that value, and a 0 in each spot a number wasn’t used.

0 1 1 1

**0111**

25 = 32 which is too big since 32 > 18 so we start subtracting with 24

18 - 24 = 18 - 16 = 2 2 ≥ 23 = 2 ≥ 8 = FALSE so compare the next number

2 ≥ 22 = 2 ≥ 4 = FALSE so compare the next number

2 ≥ 21 = 2 ≥ 2 = TRUE so next is 21

2 - 21 = 2 - 2 = 0 Since we hit zero, we stop.

Place a 1 in each spot where we subtracted that value, and a 0 in each spot a number wasn’t used.

0 0 0 1 0 0 1 0

**0001 0010**

29 = 512 which is too big since 512 > 343 so we start subtracting with 28

343 - 28 = 343 - 256 = 87 87 ≥ 27 = 87 ≥ 128 = FALSE so compare the next number

87 ≥ 26 = 87 ≥ 64 = TRUE so next is 26

87 - 26 = 87 - 64 = 23 23 ≥ 25 = 23 ≥ 32 = FALSE so compare the next number

23 ≥ 24 = 23 ≥ 16 = TRUE so next is 24

23 - 24 = 23 - 16 = 7 7 ≥ 23 = 7 ≥ 8 = FALSE so compare the next number

7 ≥ 22 = 7 ≥ 4 = TRUE so next is 22

7 - 22 = 7 - 4 = 3 3 ≥ 21 = 3 ≥ 2 = TRUE so next is 21

3 - 21 = 3 - 2 = 1 1 ≥ 20 = 1 ≥ 1 = TRUE so next is 20

1 - 10 = 1 - 1 = 0 Since we hit zero, we stop.

Place a 1 in each spot where we subtracted that value, and a 0 in each spot a number wasn’t used.

0 0 0 1 0 1 0 1 0 1 1 1

**0001 0101 0111**

211 = 2048 which is too big since 2048 > 1562 so we start subtracting with 210

1562 - 210 = 1562 - 1024 = 538 538 ≥ 29 = 538 ≥ 512 = TRUE so next is 29

538 - 29 = 538 - 512 = 26 26 ≥ 28 = 26 ≥ 256 = FALSE so compare the next number

26 ≥ 27 = 26 ≥ 128 = FALSE so compare the next number

26 ≥ 26 = 26 ≥ 64 = FALSE so compare the next number

26 ≥ 25 = 26 ≥ 32 = FALSE so compare the next number

26 ≥ 24 = 26 ≥ 16 = TRUE so next is 24

26 - 24 = 26 - 16 = 10 10 ≥ 23 = 10 ≥ 8 = TRUE so next is 23

10 - 23 = 10 - 8 = 2 2 ≥ 22 = 2 ≥ 4 = FALSE so compare the next number

2 ≥ 21 = 2 ≥ 2 = TRUE so next is 21

2 - 21 = 2 - 2 = 0 Since we hit zero, we stop.

Place a 1 in each spot where we subtracted that value, and a 0 in each spot a number wasn’t used.

0 1 1 0 0 0 0 1 1 0 1 0

**0110 0001 1010**

Decimal -> Hexadecimal---------------------------------------------

1. **13**
2. **47**
3. **216**
4. **1797**

Convert to binary:

24 = 16 which is too big since 16 > 13 so we start subtracting with 23

13 - 23 = 13 - 8 = 5 5 ≥ 22 = 5 ≥ 4 = TRUE so next is 22

5 - 22 = 5 - 4 = 1 1 ≥ 21 = 1 ≥ 2 = FALSE so compare the next number

1 ≥ 20 = 1 ≥ 1 = TRUE so next is 20

1 - 20 = 1 - 1 = 0 Since we hit zero, we stop.

Place a 1 in each spot where we subtracted that value, and a 0 in each spot a number wasn’t used.

1 1 0 1

1101

\*Note that 10-15 = A-F in hexadecimal.

**D**

Convert to binary:

26 = 64 which is too big since 64 > 47 so we start subtracting with 25

47 - 25 = 47 - 32 = 15 15 ≥ 24 = 15 ≥ 16 = FALSE so compare the next number

15 ≥ 23 = 15 ≥ 8 = TRUE so next is 23

15 - 23 = 15 - 8 = 7 7 ≥ 22 = 7 ≥ 4 = TRUE so next is 22

7 - 22 = 7 - 4 = 3 3 ≥ 21 = 3 ≥ 2 = TRUE so next is 21

3 - 21 = 3 - 2 = 1 1 ≥ 20 = 1 ≥ 1 = TRUE so next is 20

1 - 20 = 1 - 1 = 0 Since we hit zero, we stop.

Place a 1 in each spot where we subtracted that value, and a 0 in each spot a number wasn’t used.

0 0 1 0 1 1 1 1

0010 1111

Convert each set of 4 into a digit in hex

0010 = 2

1111 = F

**2F**

Convert to binary:

28 = 256 which is too big since 256 > 216 so we start subtracting with 27

216 - 27 = 216 - 128 = 88 88 ≥ 26 = 88 ≥ 64 = TRUE so next is 26

88 - 26 = 88 - 64 = 24 24 ≥ 25 = 24 ≥ 32 = FALSE so compare the next number

24 ≥ 24 = 24 ≥ 16 = TRUE so next is 24

24 - 24 = 24 - 16 = 8 8 ≥ 23 = 8 ≥ 8 = TRUE so next is 23

8 - 23 = 8 - 8 = 0 Since we hit zero, we stop.

Place a 1 in each spot where we subtracted that value, and a 0 in each spot a number wasn’t used.

1 1 0 1 1 0 0 0

1101 1000

Convert each set of 4 into a digit in hex

1101 = D

1000 = 8

**D8**

Convert to binary:

211 = 2048 which is too big since 2048 > 1797 so we start subtracting with 210

1797 - 210 = 1797 - 1024 = 773 773 ≥ 29 = 773 ≥ 512 = TRUE so next is 29

773 - 29 = 773 - 512 = 261 261 ≥ 28 = 261 ≥ 256 = TRUE so next is 28

261 - 28 = 261 - 256 = 5 5 ≥ 27 = 5 ≥ 128 = FALSE so compare the next number

5 ≥ 26 = 5 ≥ 64 = FALSE so compare the next number

5 ≥ 25 = 5 ≥ 32 = FALSE so compare the next number

5 ≥ 24 = 5 ≥ 16 = FALSE so compare the next number

5 ≥ 23 = 5 ≥ 8 = FALSE so compare the next number

5 ≥ 22 = 5 ≥ 4 = TRUE so next is 22

5 - 22 = 5 - 4 = 1 1 ≥ 21 = 1 ≥ 2 = FALSE so compare the next number

1 ≥ 20 = 1 ≥ 1 = TRUE so next is 20

1 - 20 = 1 - 1 = 0 Since we hit zero, we stop.

Place a 1 in each spot where we subtracted that value, and a 0 in each spot a number wasn’t used.

0 1 1 1 0 0 0 0 0 1 0 1

0111 0000 0101

Convert each set of 4 into a digit in hex

0111 = 7

0000 = 0

0101 = 5

**705**

Hexadecimal -> Decimal---------------------------------------------

1. **A**
2. **3B**
3. **E7**
4. **764**

A in hex is 1010 in binary

= 1010

1 0 1 0

= 1 \* 23 = 8 + 0 \* 22 = 0 + 1 \* 21 = 2 + 0 \* 20 = 0

= 8 + 2

= **10**

OR

A is 10 in decimal and is in the first place.

So the answer is:

10 \* 160 = **10**

3 is 0011 in binary and B is 1011 in binary

= 0011 1011

0 0 1 1 1 0 1 1

= 0 \* 27 = 0 + 0 \* 26 = 0 + 1 \* 25 = 32 + 1 \* 24 = 16

* 1 \* 23 = 8 + 0 \* 22 = 0 + 1 \* 21 = 2 + 1 \* 20 = 1

= 32 + 16 + 8 + 2 + 1

= **59**

OR

3 is 3 in hex and in the second place.

B is 11 in hex and in the first place.

So the answer is:

3 \* 161 + 11 \* 160 = **59**

E is 1110 in binary and 7 is 0111 in binary

= 1110 0111

1 1 1 0 0 1 1 1

= 1 \* 27 = 128 + 1 \* 26 = 64 + 1 \* 25 = 32 + 0 \* 24 = 0

* 0 \* 23 = 0 + 1 \* 22 = 4 + 1 \* 21 = 2 + 1 \* 20 = 1

= 128 + 64 + 32 + 4 + 2 + 1

= **231**

OR

E is 15 in hex and in the second place.

7 is 7 in hex and in the first place.

So the answer is:

15\* 161 + 7 \* 160 = **231**

7 is 0111 in binary, 6 is 0110 in binary, and 4 is 0100 in binary

= 0111 0110 0100

0 1 1 1 0 1 1 0 0 1 0 0

= 0 \* 211 = 0 + 1 \* 210 = 1024 + 1 \* 29 = 512 + 1 \* 108 = 256

* 0 \* 27 = 0 + 1 \* 26 = 64 + 1 \* 25 = 32 + 0 \* 24 = 0
* 0 \* 23 = 0 + 1 \* 22 = 4 + 0 \* 21 = 0 + 0 \* 20 = 0

= 1024 + 512 + 256 + 64 + 32 + 4

= **1892**

OR

7 is 7 in hex and in the third place.

6 is 6 in hex and in the second place.

4 is 4 in hex and in the first place.

So the answer is:

7 \* 162 + 6\* 161 + 4 \* 160 = **1892**

Hexadecimal -> Binary-----------------------------------------------

1. **C**
2. **7A**
3. **B1**
4. **B7F**

C is 12 in hex.

Convert 12 to binary.

24 = 16 which is too big since 16 > 12 so we start subtracting with 23

12 - 23 = 12 - 8 = 4 4 ≥ 22 = 4 ≥ 4 = TRUE so next is 22

4 - 22 = 4 - 4 = 0 Since we hit zero, we stop

.

Place a 1 in each spot where we subtracted that value, and a 0 in each spot a number wasn’t used.

1 1 0 0

**1100**

7 is 7 in hex and A is 10 in hex

First, convert 7 to binary.

23 = 8 which is too big since 8 > 7 so we start subtracting with 22

7 - 22 = 7 - 4 = 3 3 ≥ 21 = 3 ≥ 2 = TRUE so next is 21

3 - 21 = 3 - 2 = 1 1 ≥ 20 = 1 ≥ 1 = TRUE so next is 20

1 - 20 = 1 - 1 = 0 Since we hit zero, we stop.

Place a 1 in each spot where we subtracted that value, and a 0 in each spot a number wasn’t used.

0 1 1 1

Second, convert 10 to binary.

24 = 16 which is too big since 16 > 10 so we start subtracting with 23

10 - 23 = 10 - 8 = 2 2 ≥ 22 = 2 ≥ 4 = FALSE so check the next number

2 ≥ 21 = 2 ≥ 2 = TRUE so next is 21

2 - 21 = 2 - 2 = 0 Since we hit zero, we stop.

Place a 1 in each spot where we subtracted that value, and a 0 in each spot a number wasn’t used.

1 0 1 0

Put each string of four together to get the answer:

**0111 1010**

B is 11 in hex and 1 is 1 in hex

First, convert 11 to binary.

24 = 16 which is too big since 16 > 11 so we start subtracting with 23

11 - 23 = 11 - 8 = 3 3 ≥ 22 = 3 ≥ 4 = FALSE so check the next number

3 ≥ 21 = 3 ≥ 2 = TRUE so next is 21

3 - 21 = 3 - 2 = 1 1 ≥ 20 = 1 ≥ 1 = TRUE so next is 20

1 - 20 = 1 - 1 = 0 Since we hit zero, we stop.

Place a 1 in each spot where we subtracted that value, and a 0 in each spot a number wasn’t used.

1 0 1 1

Second, convert 1 to binary.

21 = 2 which is too big since 2 > 1 so we start subtracting with 20

1 - 20 = 1 - 1 = 0 Since we hit zero, we stop.

Place a 1 in each spot where we subtracted that value, and a 0 in each spot a number wasn’t used.

0 0 0 1

Put each string of four together to get the answer:

**1011 0001**

B is 11 in hex, 7 is 7 in hex, and F is 15 in hex

First, convert 11 to binary.

24 = 16 which is too big since 16 > 11 so we start subtracting with 23

11 - 23 = 11 - 8 = 3 3 ≥ 22 = 3 ≥ 4 = FALSE so check the next number

3 ≥ 21 = 3 ≥ 2 = TRUE so next is 21

3 - 21 = 3 - 2 = 1 1 ≥ 20 = 1 ≥ 1 = TRUE so next is 20

1 - 20 = 1 - 1 = 0 Since we hit zero, we stop.

Place a 1 in each spot where we subtracted that value, and a 0 in each spot a number wasn’t used.

1 0 1 1

Second, convert 7 to binary.

23 = 8 which is too big since 8 > 7 so we start subtracting with 22

7 - 22 = 7 - 4 = 3 3 ≥ 21 = 3 ≥ 2 = TRUE so next is 21

3 - 21 = 3 - 2 = 1 1 ≥ 20 = 1 ≥ 1 = TRUE so next is 20

1 - 20 = 1 - 1 = 0 Since we hit zero, we stop.

Place a 1 in each spot where we subtracted that value, and a 0 in each spot a number wasn’t used.

0 1 1 1

Finally, convert 15 to binary.

24 = 16 which is too big since 16 > 15 so we start subtracting with 23

15 - 23 = 15 - 8 = 7 7 ≥ 22 = 7 ≥ 4 = TRUE so next is 22

7 - 22 = 7 - 4 = 3 3 ≥ 21 = 3 ≥ 2 = TRUE so next is 21

3 - 21 = 3 - 2 = 1 1 ≥ 20 = 1 ≥ 1 = TRUE so next is 20

1 - 20 = 1 - 1 = 0 Since we hit zero, we stop.

Place a 1 in each spot where we subtracted that value, and a 0 in each spot a number wasn’t used.

1 1 1 1

Put each string of four together to get the answer:

**1011 0111 1111**

Binary -> Hexadecimal-----------------------------------------------

1. **0110**
2. **1011 0100**
3. **0001 1111 0001**
4. **1110 0101 1110**

0 1 1 0

= 0 \* 23 = 0 + 1 \* 22 = 4 + 1 \* 21 = 2 + 0 \* 20 = 0

= 4 + 2

= **6**

Convert each set of 4 to decimal individually.

Firstly, convert 1011 to decimal.

1 0 1 1

= 1 \* 23 = 8 + 0 \* 22 = 0 + 1 \* 21 = 2 + 1 \* 20 = 1

= 8 + 2 + 1

= 11

11 in hex is represented by B.

Secondly, convert 0100 to decimal.

0 1 0 0

= 0 \* 23 = 0 + 1 \* 22 = 4 + 0 \* 21 = 0 + 0 \* 20 = 0

= 4

4 in hex is represented by 4.

Put the hex numbers together to get the answer:

**B4**

Convert each set of 4 to decimal individually.

Firstly, convert 0001 to decimal.

0 0 0 1

= 0 \* 23 = 0 + 0 \* 22 = 0 + 0 \* 21 = 0 + 1 \* 20 = 1

= 1

1 in hex is represented by 1.

Secondly, convert 1111 to decimal.

1 1 1 1

= 1 \* 23 = 8 + 1 \* 22 = 4 + 1 \* 21 = 2 + 1 \* 20 = 1

= 8 + 4 + 2 + 1

= 15

15 in hex is represented by F.

Finally, convert 0001 to decimal.

0 0 0 1

= 0 \* 23 = 0 + 0 \* 22 = 0 + 0 \* 21 = 0 + 1 \* 20 = 1

= 1

1 in hex is represented by 1.

Put the hex numbers together to get the answer:

**1F1**

1. H

Convert each set of 4 to decimal individually.

Firstly, convert 1110 to decimal.

1 1 1 0

= 1 \* 23 = 8 + 1 \* 22 = 4 + 1 \* 21 = 2 + 0 \* 20 = 0

= 8 + 4 + 2

= 14

14 in hex is represented by E.

Secondly, convert 0101 to decimal.

0 1 0 1

= 0 \* 23 = 0 + 1 \* 22 = 4 + 0 \* 21 = 0 + 1 \* 20 = 1

= 4 + 1

= 5

5 in hex is represented by 5.

Finally, convert 1110 to decimal.

1 1 1 0

= 1 \* 23 = 8 + 1 \* 22 = 4 + 1 \* 21 = 2 + 0 \* 20 = 0

= 8 + 4 + 2

= 14

14 in hex is represented by E.

Put the hex numbers together to get the answer:

**E5E**