



# Modul I. Lesson 4

## Operators

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# Repeat the previous lesson

- List
- Canonical
- Reference
- Nullable
- Non-nullable
- Object
- Var
- Dynamic
- Final
- Const

# Plan

- What is operator?
- Arithmetic operators
- Order of operators
- Increment and decrement
- Equals operators
- Type Test operators
- Logical operators
- Bitwise operators and Shift Operator
- Ternary: ? : , ??
- Assignment Operators

# Operator

- Operator - ma'lum bir vazifani yoki amalni bajarish xususiyatiga ega bo'lgan belgi yoki belgilar to'plami.
- Matematikada va kompyuter dasturlashda operator muayyan matematik yoki mantiqiy harakat yoki jarayonni ifodalovchi belgidir. Masalan, "\*" ko'paytirishni ko'rsatadigan arifmetik operator, "&&" esa dasturlashda mantiqiy VA funktsiyasini ifodalovchi mantiqiy operatoridir.

# Arithmetic operators

Operator	Meaning
+	Add
-	Subtract
-expr	Unary minus, also known as negation
*	Multiply
/	Divide
~/	Divide, returning an integer result
%	Get the remainder of an integer division

# Example



 main.dart

```
void main() {  
  print(2 + 3 == 5);  
  print(2 - 3 == -1);  
  print(2 * 3 == 6);  
  print(5 / 2 == 2.5); // Result is a double  
  print(5 ~/ 2 == 2); // Result is an int  
  print(5 % 2 == 1); // Remainder  
  print('5/2 = ${5 ~/ 2} r ${5 % 2}' == '5/2= 2 r 1');  
}
```

# Increment and decrement

- Dart shuningdek, prefiks va postfiksni oshirish(increment) va kamaytirish(decrement) operatorlarini ham qo'llab-quvvatlaydi.

Operator	Meaning
<code>++var</code>	<code>var = var + 1</code> (expression value is <code>var + 1</code> )
<code>var++</code>	<code>var = var + 1</code> (expression value is <code>var</code> )
<code>--var</code>	<code>var = var - 1</code> (expression value is <code>var - 1</code> )
<code>var--</code>	<code>var = var - 1</code> (expression value is <code>var</code> )

# Example

```
main.dart

void main() {
  int a;
  int b;

  a = 0;
  b = ++a; // Increment a before b gets its value.
  print(a == b); // 1 = 1

  a = 0;
  b = a++; // Increment a AFTER b gets its value.
  print(a != b); // 1 != 0

  a = 0;
  b = --a; // Decrement a before b gets its value.
  print(a == b); // -1 = -1

  a = 0;
  b = a--; // Decrement a AFTER b gets its value.
  print(a != b); // -1 != 0
}
```



# Order of Operations



main.dart

```
void main() {  
    const result = ((8000 / (5 * 10)) - 32) ~/ (29 % 5);  
    print(result);  
}
```

## Order of Operations

`expr++`    `expr--`    `()`

`-expr`    `++expr`    `--expr`

`*`    `/`    `%`    `~/`

`+`    `-`

# Exercise

1. N soni berilgan. Shu sonning juft son ekanligini aniqlang. isEven yoki isOdd dan foydalanmagan holda.
2. Ikkita berilgan butun sonlar orasida nechta butun son borligi aniqlansin.

# Type test operators

Operator	Meaning
<code>as</code>	Typecast (kutubxona prefikslarini belgilash uchun ham foydalaniladi)
<code>is</code>	True, agar ob'ekt belgilangan turga ega bo'lsa
<code>is!</code>	True, agar ob'ekt belgilangan turga ega bo'lmasa

# Example



main.dart

```
void main() {  
  double numberFloat = 10.0;  
  
  // Error: A value of type 'double' can't be  
  // assigned to a variable of type 'int'  
  int numberInt = numberFloat;  
  
  print(numberInt);  
}
```

# Example



main.dart

```
void main() {  
    double numberFloat = 10.0;  
  
    // Success: when use as operator  
    int numberInt = numberFloat as int;  
  
    print(numberInt);  
}
```

# Equality and relational operators

Operator	Meaning
<code>==</code>	Teng
<code>!=</code>	Teng emas
<code>&gt;</code>	Katta
<code>&lt;</code>	Kichik
<code>&gt;=</code>	Katta yoki teng
<code>&lt;=</code>	Kichik yoki teng

# Logical operators

Operator	Meaning
<code>! <i>expr</i></code>	ifodani o'zgartiradi (yolg'onni rostga o'zgartiradi va aksincha)
<code>  </code>	mantiqiy YOKI (OR)
<code>&amp;&amp;</code>	mantiqiy VA(AND)



# Example

1. N soni berilgan. Shu son 99-1000 oralig'ida ekanligini tekshiring.
2. N soni berilgan. Shu son 100 dan katta yoki 10 dan kichkina ekanligini tekshiring

# Operator Precedence

!

>= > < <=

!= ==

&&

||

# Example



main.dart

```
void main() {  
  print(3 > 4 && (1 < 2 || 1 < 4)); // false  
  print((3 > 4 && 1 < 2) || 1 < 4); // true  
  print(3 > 4 && 1 < 2 || 1 < 4); // true  
  
  print(3 < 4 || (1 > 2 && 1 > 4)); // true  
  print((3 < 4 || 1 > 2) && 1 > 4); // false  
  print(3 < 4 || 1 > 2 && 1 > 4); // true  
}
```

# Exercise

1. 2 ta son berilgan. Berilgan sonlardan biri manfiy bo'lsa true, aks holda false chiqaruvchi programma tuzing.
2. Foydalanuvchi tomonidan kiritilgan natural sonning "ikki xonali toq son" ekanligini tekshiring.
3. Foydalanuvchi tomonidan kiritilgan uch xonali natural sonning "barcha raqamlari har xil" ekanligini tekshiring.
4. Foydalanuvchi tomonidan kiritilgan 3 ta butun (x, y, z) sonlar uchun quyidagi mulohazani rostlikka tekshiruvchi dastur tuzing: "x, y, z sonlaridan faqat bittasi musbat son"

# Bitwise and shift operators

- Odatda, siz bitwise va shift operatorlarini butun sonlar bilan ishlatasiz.

Operator	Meaning
&	AND
	OR
^	XOR
<i>~expr</i>	Bitwise birlik to'ldiruvchisi (0 lar 1 ga, 1 lar 0 ga aylanadi)
<<	Shift left
>>	Shift right

# Bitwise: &



main.dart

```
void main() {  
    print("0 & 0 = ${0 & 0}"); // 0  
    print("0 & 1 = ${0 & 1}"); // 0  
    print("1 & 0 = ${1 & 0}"); // 0  
    print("1 & 1 = ${1 & 1}"); // 1  
  
    int a = 3; // 011  
    int b = 5; // 101  
  
    //          011  $\Rightarrow$  0|1|1  
    //          101  $\Rightarrow$  1|0|1  
    // 011 & 101 = 0|0|1 = 001 = 1  
  
    print("$a & $b = ${a & b}");  
}
```

# Bitwise: |



main.dart

```
void main() {  
    print("0 | 0 = ${0 | 0}"); // 0  
    print("0 | 1 = ${0 | 1}"); // 1  
    print("1 | 0 = ${1 | 0}"); // 1  
    print("1 | 1 = ${1 | 1}"); // 1  
  
    int a = 3; // 011  
    int b = 5; // 101  
  
    //          011  $\Rightarrow$  0|1|1  
    //          101  $\Rightarrow$  1|0|1  
    //    011 | 101 = 1|1|1 = 111 = 7  
  
    print("$a | $b = ${a | b}");  
}
```

# Bitwise: ^



main.dart

```
void main() {  
    print("0 ^ 0 = ${0 ^ 0}"); // 0  
    print("0 ^ 1 = ${0 ^ 1}"); // 1  
    print("1 ^ 0 = ${1 ^ 0}"); // 1  
    print("1 ^ 1 = ${1 ^ 1}"); // 0  
  
    int a = 3; // 011  
    int b = 5; // 101  
  
    //      011  $\Rightarrow$  0|1|1  
    //      101  $\Rightarrow$  1|0|1  
    // 011 ^ 101 = 1|1|0 = 110 = 6  
  
    print("$a ^ $b = ${a ^ b}");  
}
```



# Exercise

- Foydalanuvchi tomonidan 3ta son shunday kiritilganki, bu sonlardan 2 tasi bir biriga teng. Bir xil bo'lmagan uchinchi sonni bitwise operatorlaridan foydalanib toping.
- Agar butun son  $n$  ikkining darajasi bo'lsa, true qaytaring. Aks holda, false qaytaring. Butun son  $n$  ikkining darajasi hisoblanadi, agar  $x$  butun soni mavjud bo'lib,  $n == 2^x$  tenglikni qanoatlantirsa.

# Operator: “~”



 main.dart

```
void main() {  
    print("~0 = ${~0}"); // -1  
    print("~1 = ${~1}"); // -2  
    print("~2 = ${~2}"); // -3  
    print("~3 = ${~3}"); // -4  
    print("~4 = ${~4}"); // -5  
    print("~5 = ${~5}"); // -6  
    print("~10 = ${~10}"); // -11  
    print("~100 = ${~100}"); // -101  
}
```



 main.dart

```
void main() {  
    print("~(-0) = ${~(-0)}"); // -1  
    print("~(-1) = ${~(-1)}"); // 0  
    print("~(-2) = ${~(-2)}"); // 1  
    print("~(-3) = ${~(-3)}"); // 2  
    print("~(-4) = ${~(-4)}"); // 3  
    print("~(-5) = ${~(-5)}"); // 4  
    print("~(-10) = ${~(-10)}"); // 9  
    print("~(-100) = ${~(-100)}"); // 99  
}
```

# Shift left



 main.dart

```
void main() {  
  print("128 << 0 = ${128 << 0}"); // 128  
  print("128 << 1 = ${128 << 1}"); // 256  
  print("128 << 2 = ${128 << 2}"); // 512  
  print("128 << 3 = ${128 << 3}"); // 1024  
  print("128 << 4 = ${128 << 4}"); // 2048  
  print("128 << 5 = ${128 << 5}"); // 4096  
  print("128 << 10 = ${128 << 10}"); // 131072  
  print("128 << 100 = ${128 << 100}"); // 0  
}
```



main.dart

```
void main() {  
    print("(-128) << 0 = ${(-128) << 0}"); // -128  
    print("(-128) << 1 = ${(-128) << 1}"); // -256  
    print("(-128) << 2 = ${(-128) << 2}"); // -512  
    print("(-128) << 3 = ${(-128) << 3}"); // -1024  
    print("(-128) << 4 = ${(-128) << 4}"); // -2048  
    print("(-128) << 5 = ${(-128) << 5}"); // -4096  
    print("(-128) << 10 = ${(-128) << 10}"); // -131072  
    print("(-128) << 100 = ${(-128) << 100}"); // 0  
}
```

# Shift right



 main.dart

```
void main() {  
    print("128 >> 0 = ${128 >> 0}"); // 128  
    print("128 >> 1 = ${128 >> 1}"); // 64  
    print("128 >> 2 = ${128 >> 2}"); // 32  
    print("128 >> 3 = ${128 >> 3}"); // 16  
    print("128 >> 4 = ${128 >> 4}"); // 8  
    print("128 >> 5 = ${128 >> 5}"); // 4  
    print("128 >> 10 = ${128 >> 10}"); // 0  
    print("128 >> 100 = ${128 >> 100}"); // 0  
}
```





main.dart

```
void main() {  
  print("(-128) >> 0 = ${(-128) >> 0}"); // -128  
  print("(-128) >> 1 = ${(-128) >> 1}"); // -64  
  print("(-128) >> 2 = ${(-128) >> 2}"); // -32  
  print("(-128) >> 3 = ${(-128) >> 3}"); // -16  
  print("(-128) >> 4 = ${(-128) >> 4}"); // -8  
  print("(-128) >> 5 = ${(-128) >> 5}"); // -4  
  print("(-128) >> 10 = ${(-128) >> 10}"); // -1  
  print("(-128) >> 100 = ${(-128) >> 100}"); // -1  
}
```

# Exercise

- Ikkinchi darajasini ko'paytirish va bo'lish: Ikkinchi darajasiga mos ravishda shift left va shift right operatorlaridan foydalanib, butun sonni ko'paytiradigan va bo'ladigan ikkita funksiya yozing.
- Masalan:
- 2 ning darajasi 3 ga 10 ni ko'paytirganimdagi javob 80 chiqishi kerak
- 32 sonini 2 ning darajasi 2 yani 4 ga bo'lganimdagi javobi 8 chiqishi kerak

# Solution



main.dart

```
print((10 << 3));  
print((32 >> 2));
```



# Conditional expressions

- Ternary operator.
- Agar shart rost bo'lsa, `expr1` ni baholaydi (va uning qiymatini qaytaradi); aks holda, `expr2` qiymatini baholaydi va qaytaradi.



main.dart

```
condition ? expr1 : expr2
```

# Example



main.dart

```
void main() {  
    bool islogin = false;  
  
    var page = islogin ? 'Home' : 'SignIn';  
    print("Current page: $page");  
}
```

# Exercise

- Agar yosh 18 dan kam bo'lsa 'Bola', 18 dan 65 gacha bo'lsa 'Katta', va 65 dan oshgan bo'lsa 'Keksa' deb qaytarasin. Bunda ternar operatorlardan foydalaning.
- Bir satrni olib, uning uzunligi 10 dan katta yoki yo'qligini tekshiradigan funksiya yozing. Agar uzunligi 10 dan katta bo'lsa, 'Uzun Satr', aks holda 'Qisqa Satr'ni qaytaring. Bunda ternar operatoridan foydalaning.

# If null



main.dart

```
void main() {  
    var fetchDataEmail = "pdp@academy.com";  
    var displayEmail = fetchDataEmail ?? "No email";  
  
    var fetchDataHobby = null;  
    var displayHobby = fetchDataHobby ?? "No hobby";  
  
    // User email: pdp@academy.com  
    print("User email: $displayEmail");  
    // User hobby: No hobby  
    print("User hobby: $displayHobby");  
}
```

# Assignment Operators

- Ko'rib turganingizdek, siz = operatori yordamida qiymatlarni tayinlashingiz mumkin yani qiymat o'zlashtirishingiz mumkin!
- += kabi murakkab assignmet operatorlari

=	*=	%=	>>=	^=
+=	/=	<<=	=	&=
--=	~/=			

	Compound assignment	Equivalent expression
For an operator <i>op</i> :	<i>a op= b</i>	<i>a = a op b</i>
Example:	<i>a += b</i>	<i>a = a + b</i>

# Example



main.dart

```
void main() {  
    var a = 2; // Assign using =  
    a *= 3; // Assign and multiply: a = a * 3  
    print(a == 6);  
}
```

# Exercise

- Fahrenheitdan Selsiyga Aylantirish: Haroratni Fahrenheitdan Selsiyga aylantiradigan Formula  $C=(F-32)\times 5/9$  ni yechish uchun -= va /= operatorlaridan foydalaning.



# Solution



main.dart

```
double fahrenheit = 69;  
fahrenheit -= 32;  
fahrenheit *= 5 / 9;  
print(fahrenheit);
```

# Summary

# Interview Questions

- Operator nima?
- Arifmetik operatorlardan bir nechtasi bir ifoda(expression) da kelganida qanday taribda amal bajariladi?
- increment qanday operator?
- decrement qanday operator?
- Type test operatorlari qaysilar va ularning vazifasi nima?
- Turni tekshirish(type check) operatori qaysi va u qanday vazifani bajaradi?
- Type cast operatori qaysi va u qanday vazifani bajaradi?

- Mantiqiy va munosabat operatorlardan bir nechtasi bir ifoda(expression) da kelganida qanday taribda amal bajariladi? (1 - !, 2 - >=, >, <, <=, 3 - ==, !=, 4 - &&, 5 - ||)
- Bitwise operatorlari qaysilar va ular qanday vazifani bajaradi?
- Ternary operatori qaysi va u qanday vazifani bajaradi?
- If null operatori(??) qaysi va u qanday vazifani bajaradi?

# Homework

1. Ikki xonali son berilgan. Uning raqamlari yig'indisini hisoblovchi dastur tuzing.
2. Ikki xonali son berilgan. Uning raqamlari o'rnini almashtirishdan hosil bo'lgan sonni topib, ekranga chiqaruvchi dastur tuzing.
3. Uch xonali son berilgan uning o'nliklar xonasidagi raqam bilan yuzliklar xonasidagi raqamni almashtirishdan hosil bo'lgan sonni aniqlovchi dastur tuzing. Masalan: son=123 -> natija=213.
4. Uch xonali son berilgan uning chapdan birinchi raqamini o'chirib o'ng tarafga yozishdan hosil bo'lgan sonni aniqlovchi dastur tuzing. Masalan: son=123 -> natija=231.
5. 99 dan katta bo'lgan natural son berilgan. Berilgan sonning yuzliklar xonasidagi raqamni aniqlovchi dastur tuzing.

6. Kvadratning tomoni  $a$  berilgan. Uning perimetri va yuzasi aniqlansin.  $P = 4 \cdot a$ ;  $S = a \cdot a$
7. Nolga teng bo'lmagan ikkita son berilgan ularning yig'indisi, ayirmasi, ko'paytmasi, har birining kvadratlari topilsin.
8. 5 kg konfet 100 000 tursa, 2 kg konfet qancha turishini aniqlovchi dastur tuzing.
9.  $X$  kg konfet  $A$  so'm tursa,  $Y$  kg konfet qancha turishini aniqlovchi dastur tuzing.
10. Ushbu 12, 5, 4, 2 sonlarining o'rtacha qiymatini 3 ga bo'lgandagi natijaning butun qismini va qoldiq qismlarini toping.

11. Ikkita 2 xonali musbat son berilgan. Ular bir xil raqamlardan tuzilganligi yoki unday emasligini aniqlang.
12. Masalan: 1)  $a=21, b=12 \Rightarrow$  natija: true; 2)  $a=56, b=66 \Rightarrow$  natija: false
13. Bitta 2 xonali, bitta 3 xonali musbat son berilgan. Ularning raqamlari yig'indisi teng yoki teng emasligini aniqlang.
14. Masalan: 1)  $a=23, b=104 \Rightarrow 2+3=1+0+4$  tenglik o'rinlimi?  $\Rightarrow$  natija: true; 2)  $a=65, b=124 \Rightarrow 6+5=1+2+4$  tenglik o'rinlimi?  $\Rightarrow$  natija: false
15. Ikkita haqiqiy son berilgan. Shu sonlardan kamida bittasi manfiy bo'lsa, true qiymat chiqaruvchi programma tuzing.
16. Ikkita haqiqiy son berilgan. Shu sonlar har xil ishorali bo'lsa, true qiymat chiqaruvchi programma tuzing.
17. Berilgan N sonini juft toqligi tekshiruvchi dastur tuzing. N soni juft bo'lsa, true natija chiqaring.



18. Foydalanuvchi tomonidan kiritilgan uch xonali natural sonning "chapdan o'qiganda ham, o'ngdan o'qiganda ham bir xil" ekanligini tekshiring.
19. Foydalanuvchi tomonidan ketma-ket kiritilgan 3 ta butun sonning o'suvchi tartibda kiritilganligini tekshiruvchi dastur tuzing. O'sish tartibida ( $x < y < z$ ) bo'lsa, true qiymatini ekranga chiqaring.
20. Foydalanuvchi tomonidan kiritilgan 2 ta butun ( $x$  va  $y$ ) sonlar uchun quyidagi mulohazani rostlikka tekshiruvchi dastur tuzing: " $x$  va  $y$  sonlari toq sonlar".
21. Foydalanuvchi tomonidan kiritilgan natural sonning "uch xonali juft son" ekanligini tekshiruvchi dastur tuzing.
22. Foydalanuvchi tomonidan kiritilgan 3 ta butun ( $x$ ,  $y$ ,  $z$ ) sonlar uchun quyidagi mulohazani rostlikka tekshiruvchi dastur tuzing: " $x$ ,  $y$ ,  $z$  sonlaridan istalgan bittasi qolgan ikkitasining yig'indisidan kichik".



23. condition ? expr1 : expr2 dan foydalanib 2 ta sonning minimum ni topish kodini yozing.
24. Berilgan son musbat bo'lsa Ismingizni, manfiy bo'lsa Familiyangizni chop qiladigan kod yozing.
25. A va B sonlari berilgan ( $A > B$ ). Qoldikli bo'lish operatorini ishlatmasdan A ni B ga bo'lgandagi qoldiqni toping.
26. Uchta son berilgan. Shu sonlarning kichigini aniqlovchi programma tuzilsin.
27. 3 ta sonni qiymatini bir biri bilan almashtiring. Qo'shimcha o'zgaruvchisiz.
28. 5 ta butun son berilgan. Shu sonlar orasida nechta musbat va nechta manfiy, nechta nol raqami borligini aniqlovchi hamda 5 ta sondan kattasini topuvchi dastur tuzing.

# Q&A

**Thank you for your time!**