

Input/output in Fortran

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1. Formatted and unformatted I/O

- Formatted: ascii output. This is good for reporting, but not for numeric data storage.
- Unformatted: binary output. Great for further processing of output data.
- Beware: binary data is machine-dependent. Use hdf5 for portable binary.

2. I/O commands

- Print simple output to terminal
- Write output to terminal or file ('unit')
- Read input from terminal or file
- Open, Close for files and streams
- Format format specification that can be used in multiple statements.

3. Simple print

All on one line:

```
print *, "The result is", result  
print *, item1, item2, item3
```

4. Implicit do loops

Parametrized printing with an implicit do loop:

```
print *,( i*i,i=1,n)
```

All values will be printed on the same line.

5. Array printing

- `print *`, `A` prints whole array, column-major
- Implicit do loops:

```
print *, ( A(i,i), i=1,n)
```

Can also be nested.

6. Formats

- Fine control of input/output.
- Direct use in print statement:

```
print '(a6,3f5.3)', "Result", x, y, z  
print '("Result:", 3f5.3)', x, y, z
```

- Format statement:

```
print 10, "result:", x, y, z  
10 format('(a6,3f5.3)')
```

7. Format specifiers

- '*an*' specifies a string of *n* characters. If the actual string is longer, it is truncated in the output.
- '*in*' specifies an integer of up to *n* digits. If the actual number takes more digits, it is rendered with asterisks.
- '*f_{m.n}*' specifies a fixed point representation of a real number, with *m* total positions (including the decimal point) and *n* digits in the fractional part.
- '*e_{m.n}*' Exponent representation.
- Strings can go into the format:

```
print '("Result:",3f5.3)',x,y,z
```

- 'x' for a space, '/' for newline

8. Format repetitions

```
print '( 3i4 )', i1,i2,i3  
print '( 3(i2,":",f7.4) )', i1,r1,i2,r2,i3,r2
```

9. Repeats and line breaks

- If `abc` is a format string, then `10(abc)` gives 10 repetitions. There is no line break.
- If there is more data than specified in the format, the format is reused in a new print statement. This causes line breaks.
- The `/` (slash) specifier causes a line break.
- There may be a 80 character limit on output lines.

Exercise 1

Use formatted I/O to print the number $0 \cdots 99$ as follows:

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99