Digit Representations

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This command generates the generalized "decimal" representation of a given rational number. *DigitRepresentation[r,b]* takes as input a rational number *r* (in decimal representation) and an optional base *b* (default is 10). The base *b* must be an integer between 2 and 36.

In[1]:=
```
DigitRepresentation[fraction_, base_: 10] :=
 Module[{nr = fraction, b, d1, d2, d3, fp, d, pos}, b = base;
  d1 = IntegerString[IntegerPart[nr], b]; nr = nr - IntegerPart[nr]; fp = {}; d = {};
  While[Not[MemberQ[fp, nr]], fp = Append[fp, nr]; nr = b nr;
   d = Append[d, IntegerPart[nr]]; nr = nr - IntegerPart[nr];];
  pos = Position[fp, nr][[1, 1]]; d2 = If[pos > 1, d[[1 ;; pos - 1]], {}];
  d3 = d[[pos ;; Length[d]]];
  Print[If[b == 10, "", "("], d1, ".",
   If[d2 == {}, "", IntegerString[FromDigits[d2, b], b, Length[d2]]], If[
    d3 == {} || d3 == {0}, "", OverBar[IntegerString[FromDigits[d3, b], b, Length[d3]]]],
   If[b == 10, "", ")"], If[b == 10, "", Subscript["", b]]]]
```

In[2]:=
```
DigitRepresentation[1 / 4]
```

0.25

In[3]:=
```
DigitRepresentation[2 / 3]
```

$0.\overline{6}$

In[4]:=
```
DigitRepresentation[380 / 959]
```

$0.\overline{396246089676746611053180}$

In[5]:=
```
DigitRepresentation[1 / 4, 3]
```

$(0.\overline{02})_3$

Check:

In[6]:=
```
2/3^2 + 2/3^4 + 2/3^6 + 2/3^8 + 2/3^10
N[2/3^2 + 2/3^4 + 2/3^6 + 2/3^8 + 2/3^10]
```

Out[6]= $\frac{14\,762}{59\,049}$

Out[7]= 0.249996

In[8]:=
```
DigitRepresentation[38 370 / 9, 23]
```

$(818.\overline{7f})_{23}$

Check:

In[9]:=
```
N[38 370 / 9, 20]
N[8 × 23^2 + 1 × 23^1 + 8 × 23^0 + 7 × 23^-1 + 15 × 23^-2 + 7 × 23^-3 + 15 × 23^-4, 20]
```

Out[9]= 4263.3333333333333333

Out[10]= 4263.3333321421807383

In[11]:=
```
DigitRepresentation[38 370 / (9 × 23^5), 23]
```

$(0.008187\overline{7f})_{23}$