Pensieve header: January 20: Textbook (EIWL) chapters 5-8, evaluated.

5. Operations on Lists

```
{1, 2, 3} + 10
```

```
{11, 12, 13}
```

```
{1, 1, 2} * {1, 2, 3}
```

```
{1, 2, 6}
```

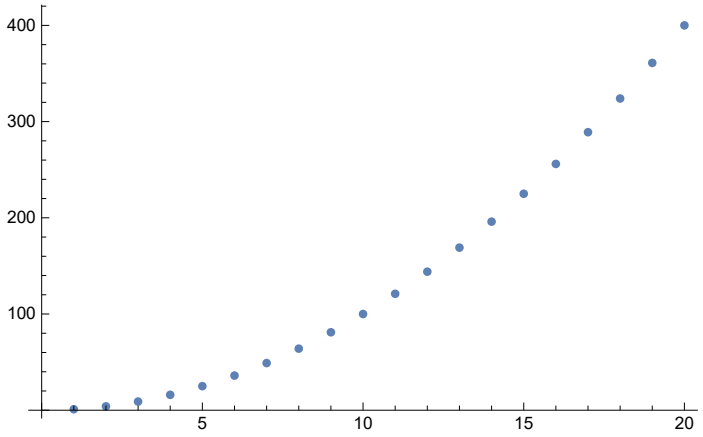
```
{1, 1, 2}.{1, 2, 3}
```

```
9
```

```
Range[10]^2
```

```
{1, 4, 9, 16, 25, 36, 49, 64, 81, 100}
```

```
ListPlot[Range[20]^2]
```




```
Sort[{4, 2, 1, 3, 6}]
```

```
{1, 2, 3, 4, 6}
```

```
? Sort
```

Sort[*list*] sorts the elements of *list* into canonical order.

Sort[*list*, *p*] sorts using the ordering function *p*. ≫

```
l = Table[RandomReal[{-1, 1}], 20]
```

```
{-0.1647, -0.95226, -0.163569, 0.872585, -0.0737378, 0.486217, -0.666849,
 -0.195779, 0.301817, 0.451436, -0.493966, -0.915324, -0.769855, -0.810651,
 -0.946107, 0.41485, -0.185635, -0.00243751, -0.585756, 0.954066}
```

```
Sort[l]
```

```
{-0.95226, -0.946107, -0.915324, -0.810651, -0.769855, -0.666849,
 -0.585756, -0.493966, -0.195779, -0.185635, -0.1647, -0.163569, -0.0737378,
 -0.00243751, 0.301817, 0.41485, 0.451436, 0.486217, 0.872585, 0.954066}
```

```
Sort[l, Abs[#1] < Abs[#2] &]
```

```
{-0.00243751, -0.0737378, -0.163569, -0.1647, -0.185635, -0.195779,
 0.301817, 0.41485, 0.451436, 0.486217, -0.493966, -0.585756, -0.666849,
 -0.769855, -0.810651, 0.872585, -0.915324, -0.946107, -0.95226, 0.954066}
```

```
Length[{5, 3, 4, 5, 3, 4, 5}]
```

```
7
```

```
N2 = (#1 * #1 - #2^2) &
```

```
#1 #1 - #2^2 &
```

```
N2[2, 3]
```

```
-5
```

```
N3 = (#1 * #3 - #2^2) &
```

```
N3[2, 3]
```

```
Function::slotn : Slot number 3 in #1 #3 - #2^2 & cannot be filled from (#1 #3 - #2^2 &)[2, 3]. >>
```

```
-9 + 2 #3
```

```
N4 = Function[{x, t}, x^2 - t^2]
```

```
Function[{x, t}, x^2 - t^2]
```

```
N4[2, 3]
```

```
-5
```

```
Total[{1, 1, 2, 2}]
```

```
6
```

```
Total[Range[100]]
```

```
5050
```

```
Clear[a]
```

```
Count[{a, b, a, a, c, b, a}, a]
```

```
4
```

```
First[{7, 6, 5}]
```

```
7
```

```
Last[{7, 6, 5}]
```

```
5
```

```
? Prime
```

Prime[n] gives the n^{th} prime number. ≫

```
ll = Prime /@ Range[10]
```

```
{2, 3, 5, 7, 11, 13, 17, 19, 23, 29}
```

```
Last[ll]
```

```
29
```

```
First[ll]
```

```
2
```

```
Rest[ll]
```

```
{3, 5, 7, 11, 13, 17, 19, 23, 29}
```

```
Most[ll]
```

```
{2, 3, 5, 7, 11, 13, 17, 19, 23}
```

```
Second[ll]
```

```
Second[{2, 3, 5, 7, 11, 13, 17, 19, 23, 29}]
```

```
Part[ll, 4]
```

```
7
```

```
ll // Rest // First
```

```
3
```

```
ll[[4]]
```

```
7
```

```
ll[[3 ;; 7]]
```

```
{5, 7, 11, 13, 17}
```

```
ll[[3 ;;]]
```

```
{5, 7, 11, 13, 17, 19, 23, 29}
```

```
ll[[ ;; 6]]
```

```
{2, 3, 5, 7, 11, 13}
```

```
? ;;
```

i ;; *j* represents a span of elements *i* through *j*.

i ;; represents a span from *i* to the end.

;; *j* represents a span from the beginning to *j*.

;; represents a span that includes all elements.

i ;; *j* ;; *k* represents a span from *i* through *j* in steps of *k*.

i ;; ;; *k* represents a span from *i* to the end in steps of *k*.

;; *j* ;; *k* represents a span from the beginning to *j* in steps of *k*.

;; ;; *k* represents a span from the beginning to the end in steps of *k*. >>

```
ll[[-3]]
```

```
19
```

```
ll[[0]]
```

```
List
```

```
Expand[(x + y)^10][[7]]
```

$$210\, x^4\, y^6$$

```
First[Sort[{6, 7, 1, 2, 4, 5}]]
```

```
1
```

```
Min[{6, 7, 1, 2, 4, 5}]
```

```
1
```

```
IntegerDigits[2^40]
```

```
{1, 0, 9, 9, 5, 1, 1, 6, 2, 7, 7, 7, 6}
```

```
Take[{101, 203, 401, 602, 332, 412}, 3]
```

```
{101, 203, 401}
```

```
Take[IntegerDigits[2^100], 10]
```

```
{1, 2, 6, 7, 6, 5, 0, 6, 0, 0}
```

```
Drop[{101, 203, 401, 602, 332, 412}, 3]
```

```
{602, 332, 412}
```

```
? Take
```

Take[*list*, *n*] gives the first *n* elements of *list*.

Take[*list*, –*n*] gives the last *n* elements of *list*.

Take[*list*, {*m*, *n*}] gives elements *m* through *n* of *list*.

Take[*list*, seq_1, seq_2, …] gives a nested list in which elements specified by seq_i are taken at level *i* in *list*. >>

6. Making Tables

```
Table[5, 10]
```

```
{5, 5, 5, 5, 5, 5, 5, 5, 5, 5}
```

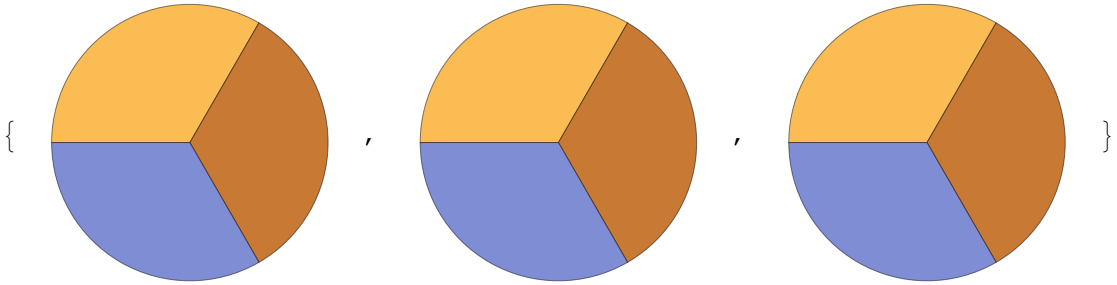
```
Table[x, 10]
```

```
{x, x, x, x, x, x, x, x, x, x}
```

```
Table[{1, 2}, 10]
```

```
{{1, 2}, {1, 2}, {1, 2}, {1, 2}, {1, 2}, {1, 2}, {1, 2}, {1, 2}, {1, 2}, {1, 2}}
```

```
Table[PieChart[{1, 1, 1}], 3]
```



```
Table[a[n], {n, 5}]
```

```
{a[1], a[2], a[3], a[4], a[5]}
```

```
Table[n + 1, {n, 10}]
```

```
{2, 3, 4, 5, 6, 7, 8, 9, 10, 11}
```

```
Table[n^2, {n, 10}]
```

```
{1, 4, 9, 16, 25, 36, 49, 64, 81, 100}
```

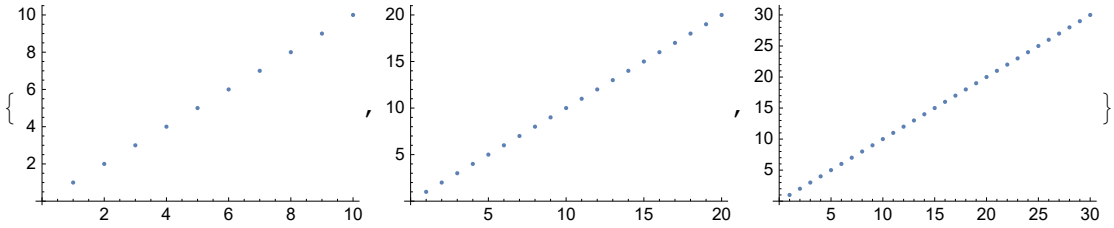
```
Table[Range[n], {n, 5}]
```

```
{{1}, {1, 2}, {1, 2, 3}, {1, 2, 3, 4}, {1, 2, 3, 4, 5}}
```

```
Table[Column[Range[n]], {n, 8}]
```

$$\left\{1,\ \begin{matrix}1\\2\end{matrix},\ \begin{matrix}1\\2\\3\end{matrix},\ \begin{matrix}1\\2\\3\\4\end{matrix},\ \begin{matrix}1\\2\\3\\4\\5\end{matrix},\ \begin{matrix}1\\2\\3\\4\\5\\6\end{matrix},\ \begin{matrix}1\\2\\3\\4\\5\\6\\7\end{matrix},\ \begin{matrix}1\\2\\3\\4\\5\\6\\7\\8\end{matrix}\right\}$$

```
Table[ListPlot[Range[10 * n]], {n, 3}]
```



```
Table[PieChart[Table[1, n]], {n, 5}]
```

```
Table[2^expt, {expt, 10}]
```

```
Table[{x, x + 1, x^2}, {x, 5}]
```

```
Table[f[n], {n, 10}]
```

```
Table[f[n], {n, 4, 10}]
```

```
Table[f[n], {n, 4, 10, 2}]
```

```
{f[4], f[6], f[8], f[10]}
```

```
Range[4, 10]
```

```
Range[4, 10, 2]
```

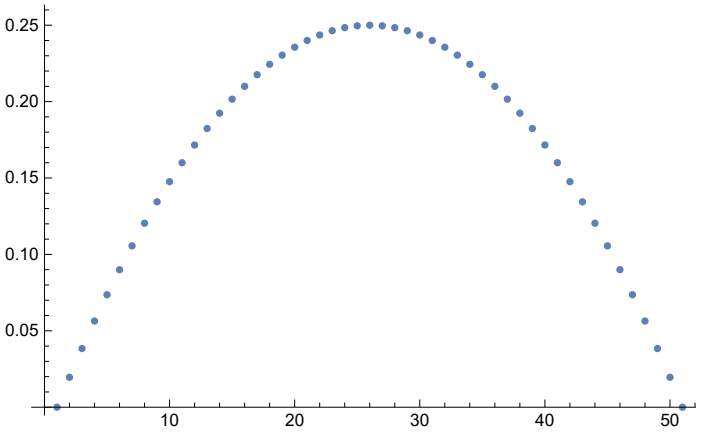
```
{4, 6, 8, 10}
```

```
f /@ Range[4, 10, 2]
```

```
{f[4], f[6], f[8], f[10]}
```

```
Range[0, 1, 0.1]
```

```
ListPlot[Table[x - x^2, {x, 0, 1, .02}]]
```



```
ListPlot[Range[0, 1, .02] - Range[0, 1, .02]^2]
```

```
Table[RandomInteger[10], 20]
```

```
{0, 10, 8, 2, 9, 1, 4, 5, 1, 9, 5, 0, 5, 5, 10, 6, 9, 5, 9, 10}
```

```
RandomInteger[10, 20]
```

7. Colors and Styles

```
Red
```

```
{Red, Green, Blue, Purple, Orange, Black}
```

```
ColorNegate[Yellow]
```

```
Blend[{Yellow, Pink, Green}]
```

```
RGBColor[1, 0, 0]
```

```
Table[RGBColor[1, g, 0], {g, 0, 1, 0.05}]
```

```
? ColorData
```

ColorData["*scheme*"] gives a function that generates colors in the named color scheme when applied to parameter values.

ColorData["*scheme*", "*property*"] gives the specified property of a color scheme.

ColorData["*collection*"] gives a list of color schemes in a named collection.

ColorData[] gives a list of named collections of color schemes. ≫

```
Hue[0.5]
```

```
Table[Hue[u], {u, 0, 1, 0.05}]
```

```
RandomColor[]
```

```
Table[RandomColor[], 30]
```

```
Blend[Table[RandomColor[], 20]]
```

```
Style[1000, Red]
```

1000

```
Style[1000, Red] + 1
```

1 + 1000

```
Table[Style[RandomInteger[1000], RandomColor[]], 30]
```

{269, 38, 839, 847, 74, 673, 207, 267, 962, 743, 649, 454, 365, 798, 395, 921, 946, 318, 47, 977, 276, 758, 258, 931, 858, 968, 426, 119, 162, 656}

```
Style[x, 30]
```

x

```
Table[Style[100, n], {n, 30}]
```

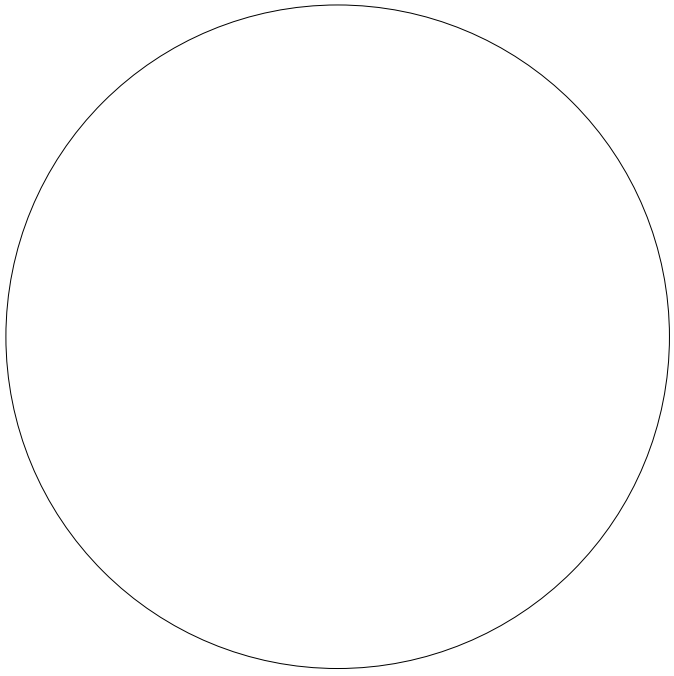
{100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100}

```
Table[Style[x, RandomColor[], RandomInteger[30]], 25]
```

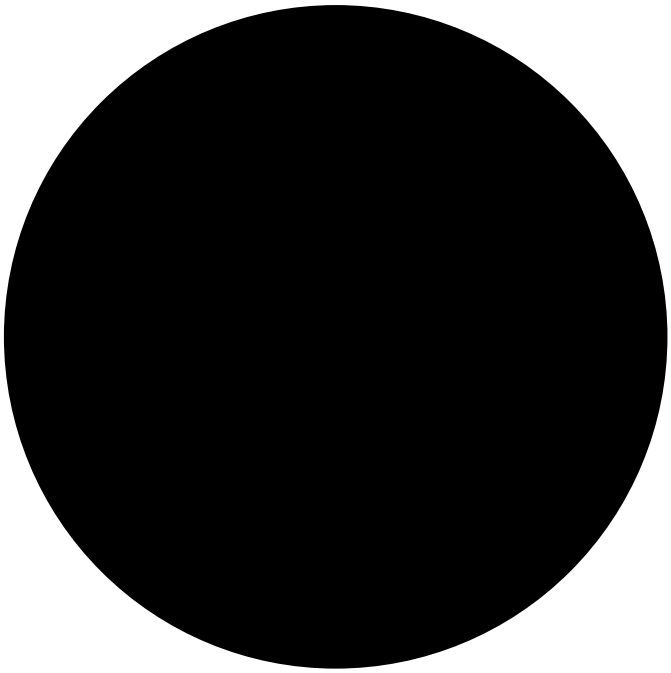
{x, x, x, x, x, x, x, x, x, x, x, x, x, x, x, x, x, x, x, x, x, x, x, x, x}

8. Basic Graphics Objects

```
Graphics[Circle[]]
```



```
Graphics[Disk[]]
```



```
?Circle
```

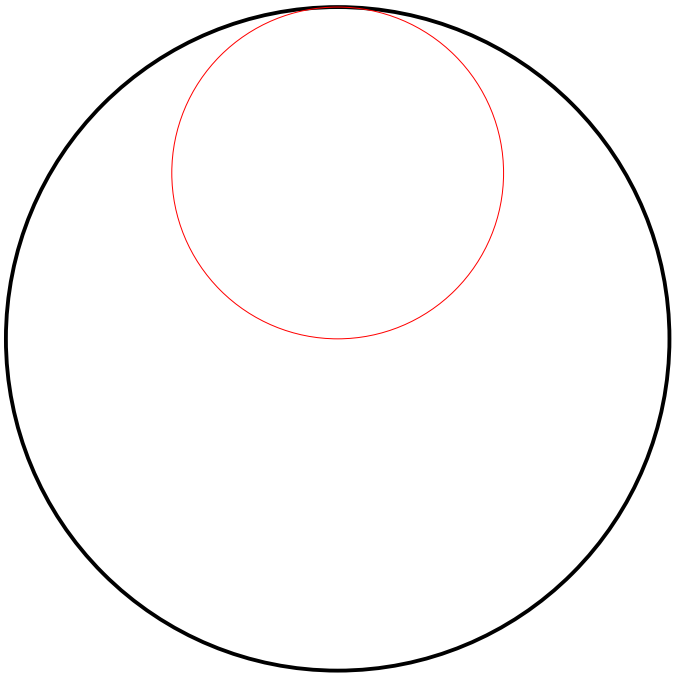
Circle[{x, y}, r] represents a circle of radius r centered at {x, y}.

Circle[{x, y}] gives a circle of radius 1.

Circle[{x, y}, {r_x, r_y}] gives an axis–aligned ellipse with semi–axes lengths r_x and r_y.

Circle[{x, y}, …, {θ_1, θ_2}] gives a circular or ellipse arc from angle θ_1 to θ_2. ≫

```
Graphics[{Thick, Circle[{0, 0}], Red, Thin, Circle[{0, 0.5}, 0.5]}]
```



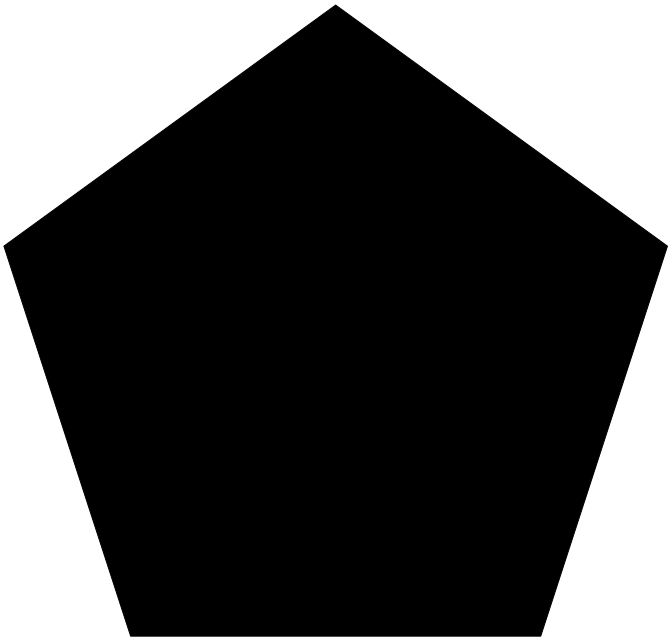
```
? Thickness
```

Thickness[r] is a graphics directive which specifies that lines which follow are to be drawn with thickness r. The thickness r is given as a fraction of the horizontal plot range. ≫

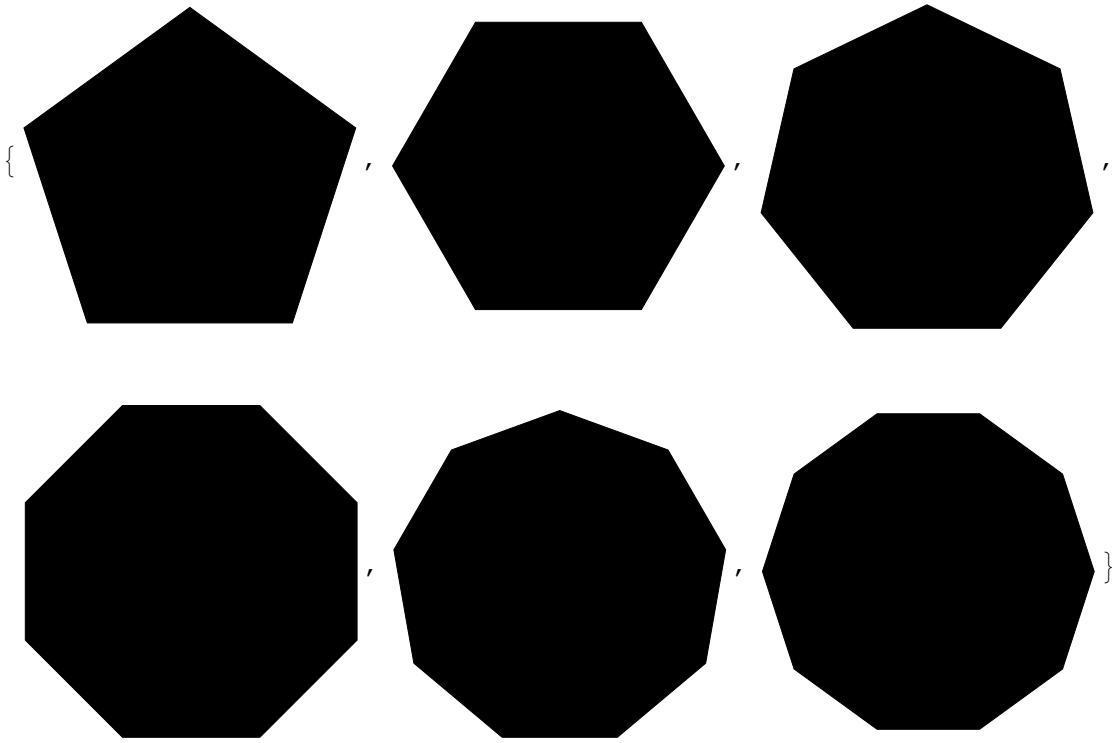
```
? Dashed
```

Dashed is a graphics directive specifying that lines that follow should be drawn dashed. ≫

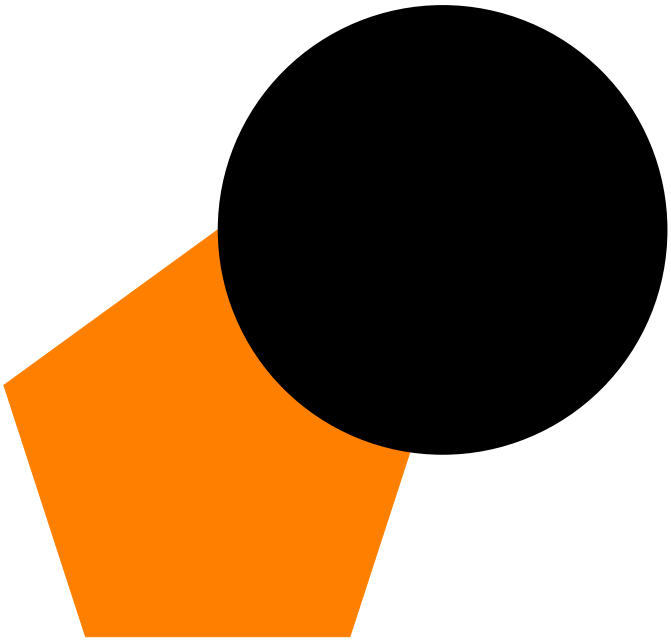
```
Graphics[RegularPolygon[5]]
```



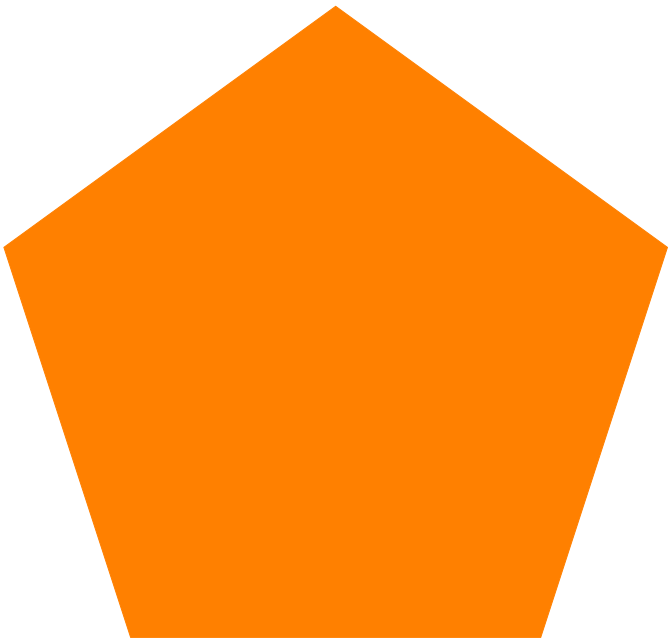
```
Table[Graphics[RegularPolygon[n]], {n, 5, 10}]
```



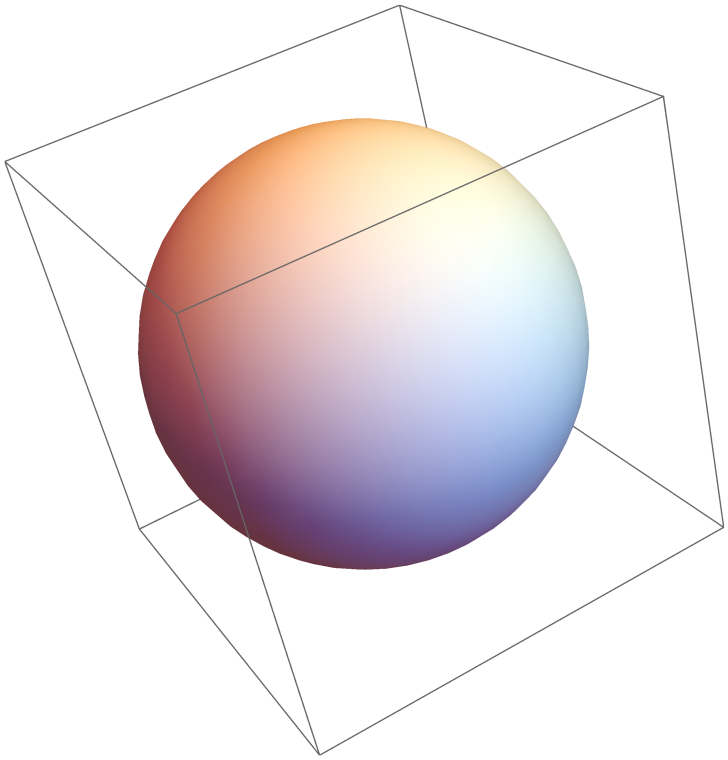
```
Graphics[{Style[RegularPolygon[5], Orange], Disk[{1, 1}]}]
```



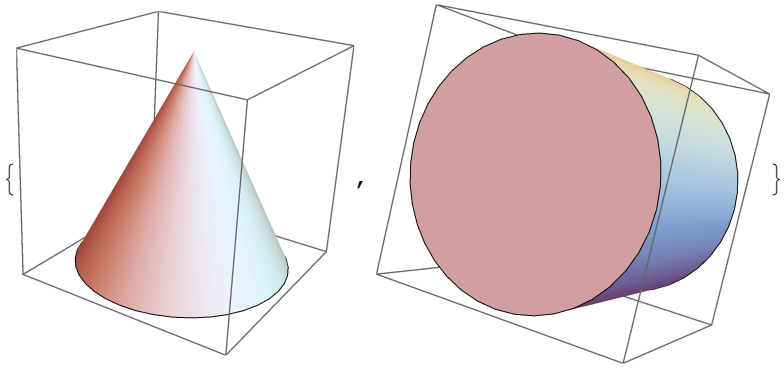
```
Graphics[{Orange, RegularPolygon[5]}]
```



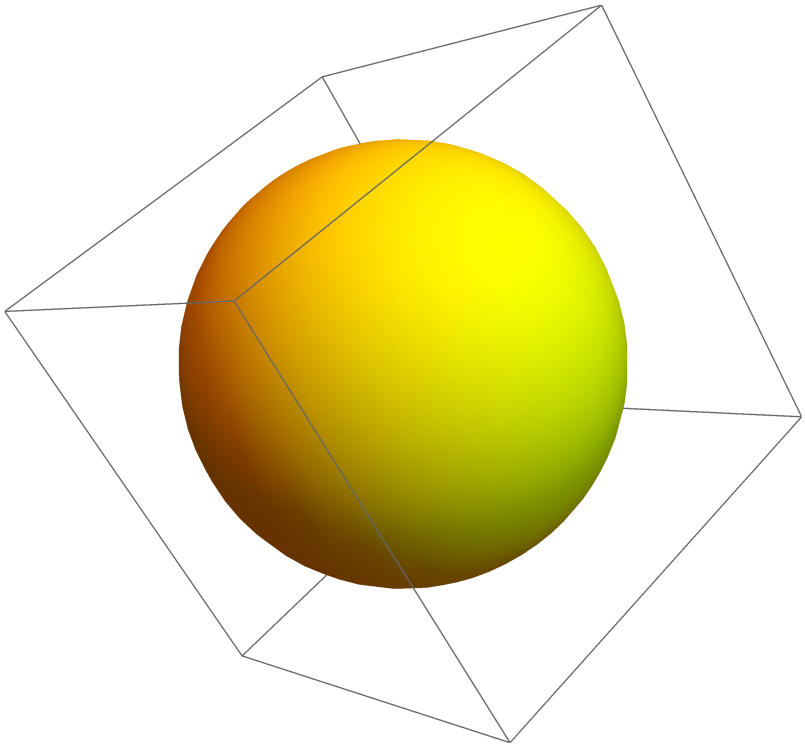
```
Graphics3D[Sphere[]]
```



```
{Graphics3D[Cone[]], Graphics3D[Cylinder[]]}
```



```
Graphics3D[Style[Sphere[], Yellow]]
```



```
Graphics3D[Style[Sphere[], Yellow], Boxed -> False]
```

CurrentImage[]