Objective: To create an applet that demonstrates the modulo operator.

23 (*mod* 12) = 11

q = 12

p = 23

Mini-Objective 1: To create sliders for integers *p* and *q*.

p (*mod* q)

q = 1

p = 0
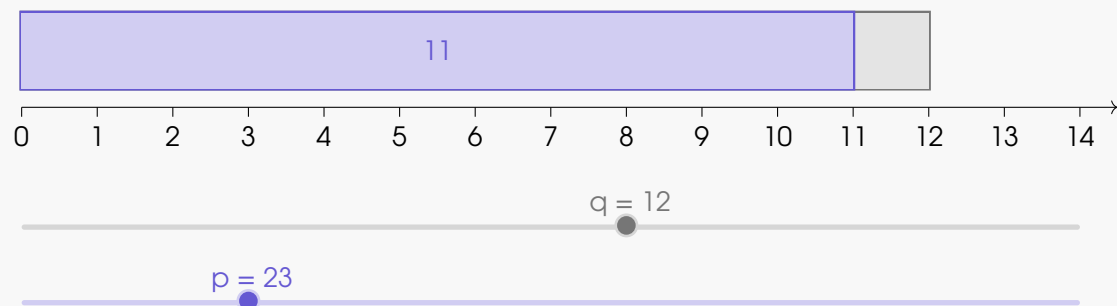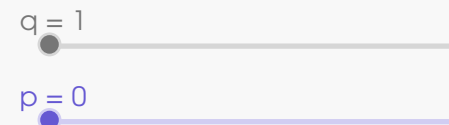
Step 1: Create a slider for *p*, such that *p* is an integer value from 0 to 100.

Slider		
Name		
p = 0		
● Number ○ Angle ○ Integer		
Interval	Slider	Animation
Min	Max	Increment
0	100	1
		CANCEL OK

Step 2: Create a slider for *q*, such that *q* is an integer value from 1 to 20.

Slider		
Name		
q = 1		
● Number ○ Angle ○ Integer		
Interval	Slider	Animation
Min	Max	Increment
1	20	1
		CANCEL OK
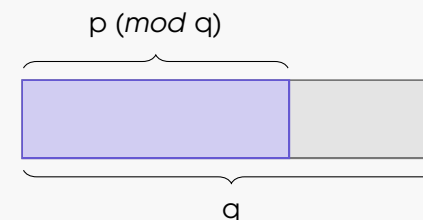
Note: If q = 0, then *p mod q* is undefined. Therefore, *q* must be greater than or equal to 1.

**Mini-Objective 2:** To represent the modulus as a fractional part of q.

p (*mod* q)

q

Step 3: Inside of the algebra window, define the following six points. In object settings, indicate points A and D as a fixed object

$A = (0,0)$
$\rightarrow = (0,0)$

$B = (q,0)$
$\rightarrow = (1,0)$

$C = (q,1)$
$\rightarrow = (1,1)$

$D = (0,1)$
$\rightarrow = (0,1)$

$E = (\text{Mod}(p,q),1)$
$\rightarrow = (1,1)$

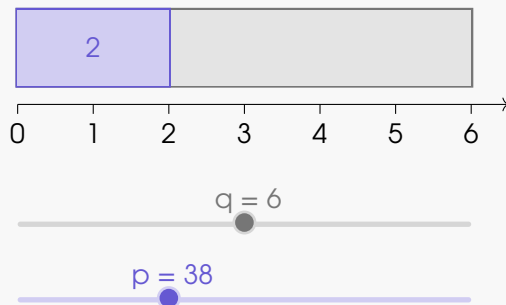| $F = (\text{Mod}(p,q),0)$ |
| --- |
| $\rightarrow = (1,0)$ |

Tip: To access object setting, right-click on an object and then select settings.

Step 4: Select the Polygon tool. To represent p (*mod* q), select points A → B → C → D → A. To represent q, select points A → D → E → F → A. Hide all points.
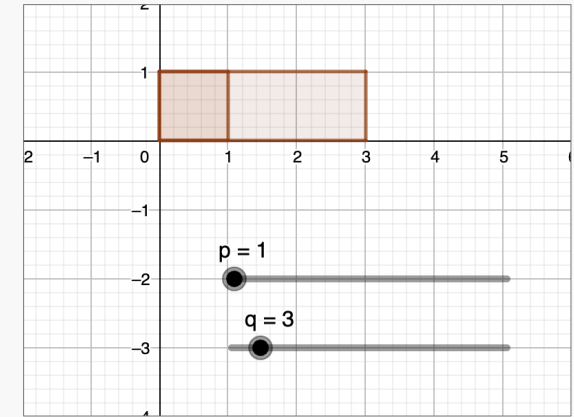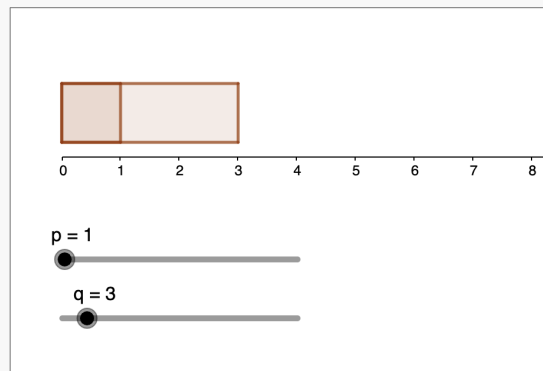
Mini-Objective 3: To add some final touches.

$$38 \ (mod \ 6) = 2$$

$q = 6$

$p = 38$

Step 5: In graphics settings, hide the grid and y-axis. Show the x-axis in the positive direction only and have the x-axis cross at $y = -0.25$

Tip: To access graphics settings, right-click on the graphics window and then select, ✿ Graphics.

Step 6: Select the Text tool to create a label that provides the value of p (*mod* q).

Text

B | / | Serif | LaTeX formula

p (mod q) = Mod(p, q)

▸ Advanced

CANCEL | OK

Tip: To provide the value of an object, select the advanced drop-down, navigate to the objects tab and select empty box.

Step 7: Customize the appearance to your liking.

74 (mod 10) = 4