Inequality Regions

1. Shade the regions in the xy-plane which satisfy the following inequalities:

   (a) $1 \leqslant x \leqslant 2$ and $-1 \leqslant y \leqslant 3$. $\boxed{(1,-1),(2,-1),(2,3),(1,3)}$

   (b) $x \geqslant 0$ and $y \geqslant 0$ and $y \leqslant -3x + 7$. $\boxed{(0,0),(0,7),(\frac{7}{3},0)}$

   (c) $x \geqslant 0$ and $y \geqslant 1$ and $2x + y \leqslant 8$. $\boxed{(0,1),(0,8),(\frac{7}{2},1)}$

   (d) $y \leqslant x$ and $y \geqslant -1$ and $x + y \leqslant 6$. $\boxed{(-1,-1),(3,3),(7,-1)}$

   (e) $x \geqslant 1$ and $x + y \leqslant 8$ and $y \geqslant 2x - 3$. $\boxed{(1,-1),(1,7),(\frac{11}{3},\frac{13}{3})}$

   (f) $2y \geqslant x$ and $x + y \leqslant 8$ and $y \leqslant 2x$. $\boxed{(0,0),(\frac{8}{3},\frac{16}{3}),(\frac{16}{3},\frac{8}{3})}$

   (g) $y \leqslant x + 6$ and $y \geqslant 4x + 6$ and $2x + y + 4 \geqslant 0$. $\boxed{(0,6),(-\frac{10}{3},\frac{8}{3}),(-\frac{5}{3},-\frac{2}{3})}$

2. Find the sets of inequalities that define the following triangles:

   (a) $(1,0)$, $(1,5)$ and $(6,0)$. $\boxed{x + y \leqslant 6,\ y \geqslant 0,\ x \geqslant 1}$

   (b) $(0,0)$, $(0,5)$ and $(-10,0)$. $\boxed{x \leqslant 0,\ y \geqslant 0,\ 2y \leqslant x + 10}$

   (c) $(-1,-1)$, $(-2,-1)$ and $(-1,-3)$. $\boxed{y \leqslant -1,\ x \leqslant -1,\ 2x + y + 5 \geqslant 0}$

   (d) $(4,5)$, $(-1,0)$ and $(3,-1)$. $\boxed{y \geqslant 6x - 19,\ y \leqslant x + 1,\ x + 4y + 1 \geqslant 0}$

   (e) $(5,1)$, $(-3,-1)$ and $(2,-3)$. $\boxed{4y \leqslant x - 1,\ 3y \geqslant 4x - 17,\ 2x + 5y + 11 \geqslant 0}$

3. Find the inequality that describes the area above the line $y = 5$. $\boxed{y > 5}$

4. Find the inequality that describes the area to the left of the line $x = -1$. $\boxed{x < -1}$

5. Find the triple inequality that describes the area in between the lines $x = 0$ and the line $x = 7$.

   $\boxed{0 < x < 7}$

6. Find the triple inequality that describes the area in between the lines $y = \frac{1}{2}$ and the line $y = 2$.

   $\boxed{\frac{1}{2} < y < 2}$

7. Find the triple inequality that describes the area in between the lines $x = \pi$ and the line $x = 2\pi$.

   $\boxed{\pi < x < 2\pi}$

8. Find the two triple inequalities that describe the interior of the rectangle formed by the points $(-1,3)$, $(-1,5)$, $(2,5)$ and $(2,3)$. $\boxed{-1 < x < 2 \text{ and } 3 < y < 5}$

9. Find the two triple inequalities that describe the interior of the rectangle formed by the points $(1,0)$, $(1,4)$, $(4,4)$ and $(4,0)$. $\boxed{1 < x < 4 \text{ and } 0 < y < 4}$

10. Find the two triple inequalities that describe the interior of the rectangle formed by the points $(\frac{1}{3},-1)$, $(\frac{1}{3},2)$, $(\frac{5}{2},2)$ and $(\frac{5}{2},-1)$. $\boxed{\frac{1}{3} < x < \frac{5}{2} \text{ and } -1 < y < 2}$

11. Find the inequalities that describe the interior of the triangle formed by the points $(0,0)$, $(2,0)$ and $(0,2)$. $\boxed{x > 0 \text{ and } y > 0 \text{ and } x + y < 2}$

12. Find the inequalities that describe the interior of the triangle formed by the points $(0,0)$, $(3,0)$ and $(0,-3)$. $\boxed{x > 0 \text{ and } y < 0 \text{ and } y > x - 3}$

13. Find the inequalities that describe the interior of the triangle formed by the points $(0,0)$, $(-4,0)$ and $(0,-4)$. $\boxed{x<0 \text{ and } y<0 \text{ and } x+y+4>0}$

14. Find the inequalities that describe the interior of the triangle formed by the points $(0,0)$, $(2,0)$ and $(0,4)$. $\boxed{x>0 \text{ and } y>0 \text{ and } 2x+y<4}$

15. Find the inequalities that describe the interior of the triangle formed by the points $(0,0)$, $(0,1)$ and $(-3,0)$. $\boxed{x<0 \text{ and } y>0 \text{ and } 3y<x+3}$

16. Find the inequalities that describe the interior of the triangle formed by the points $(1,1)$, $(5,1)$ and $(5,3)$. $\boxed{x<5 \text{ and } y>1 \text{ and } 2y<x+1}$

17. Find the inequalities that describe the interior of the triangle formed by the points $(2,3)$, $(4,3)$ and $(3,4)$. $\boxed{y>3 \text{ and } x+y<7 \text{ and } y<x+1}$

18. Find the inequalities that describe the interior of the triangle formed by the points $(-2,3)$, $(2,3)$ and $(0,2)$. $\boxed{y<3 \text{ and } 2y>x+4 \text{ and } x+2y>4}$

19. HARDER. Shade the following regions:

    (a) $1 \leqslant xy \leqslant 2$.