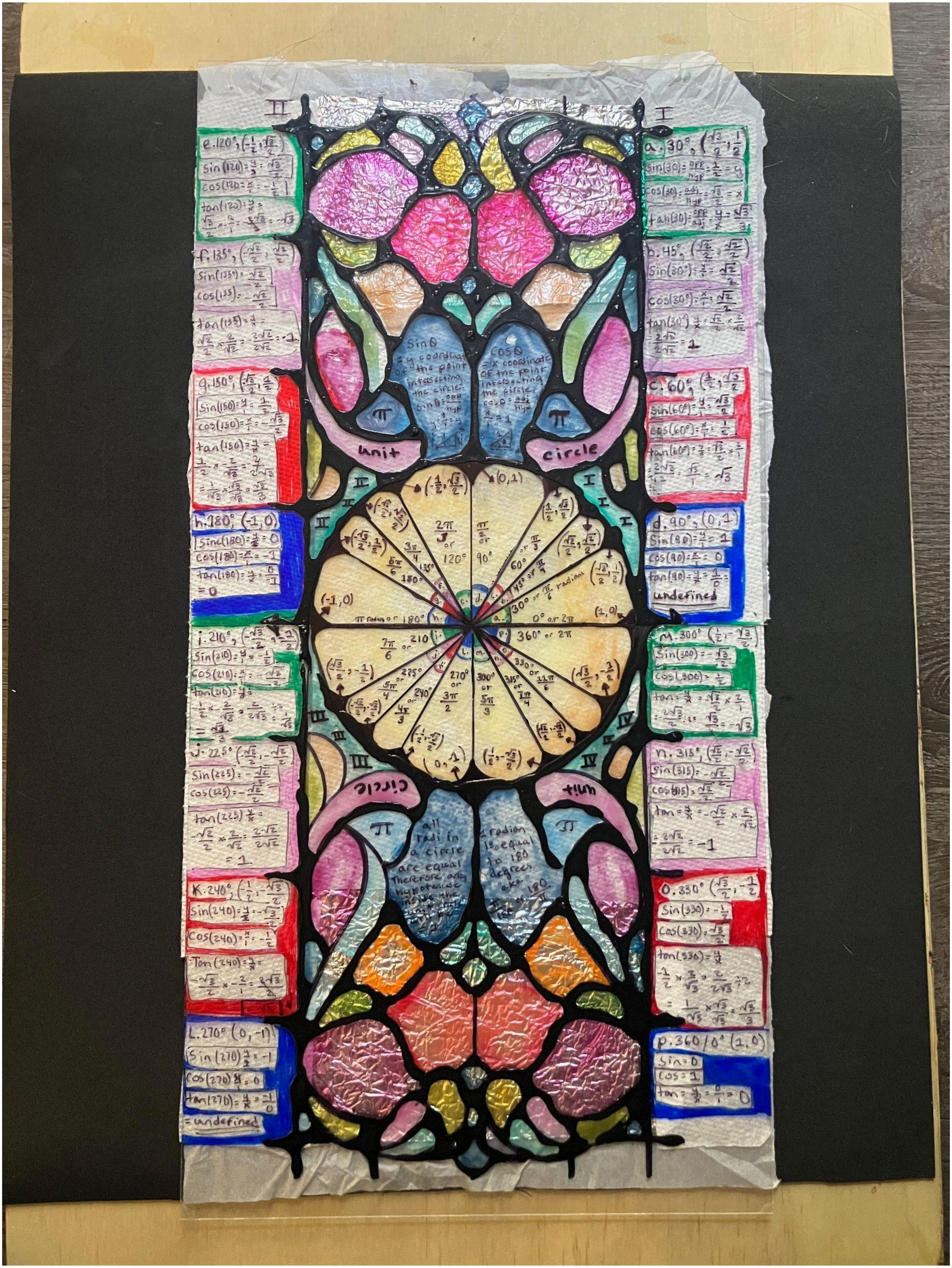
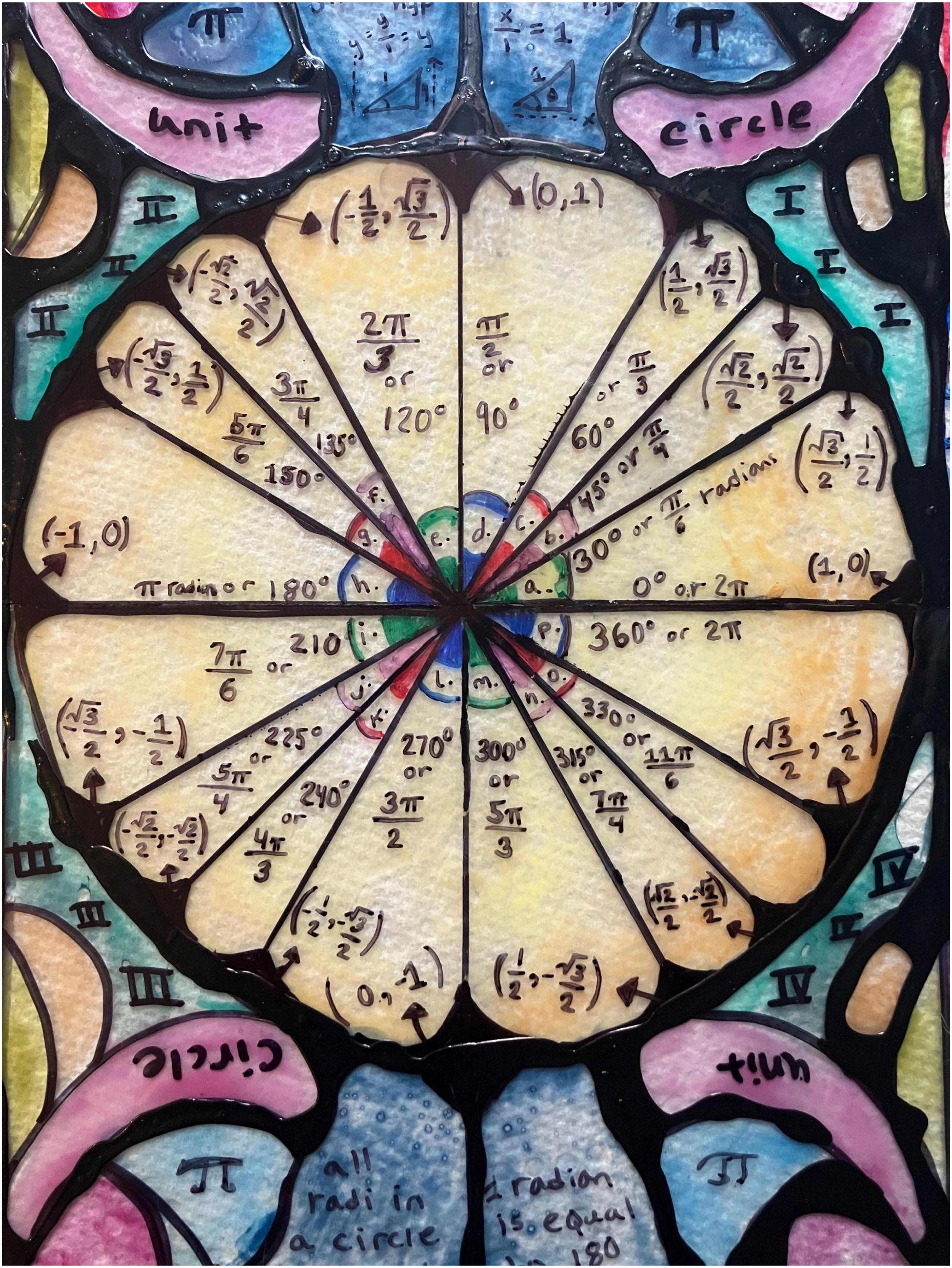
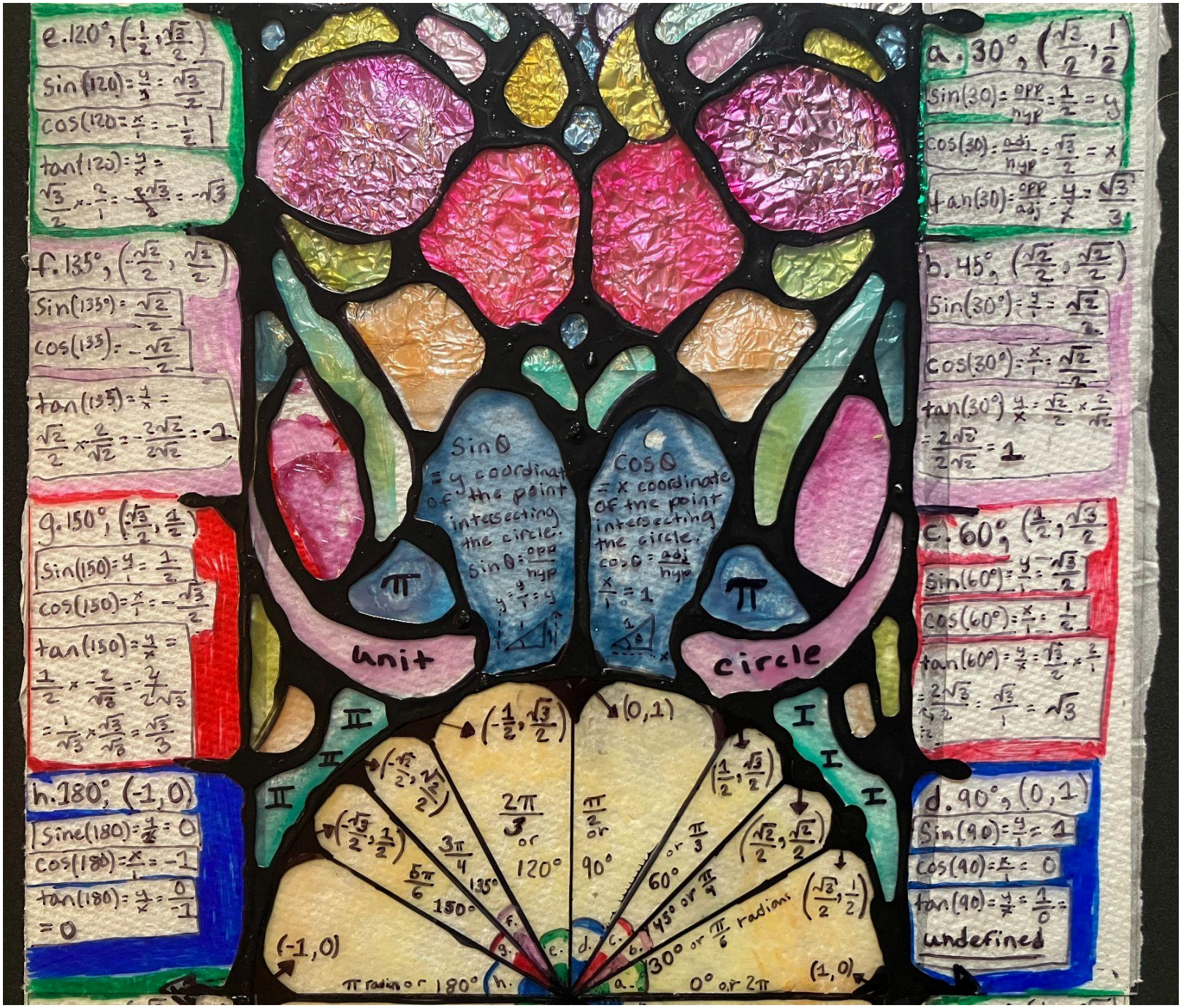
Unit Circle - Stained Glass Window

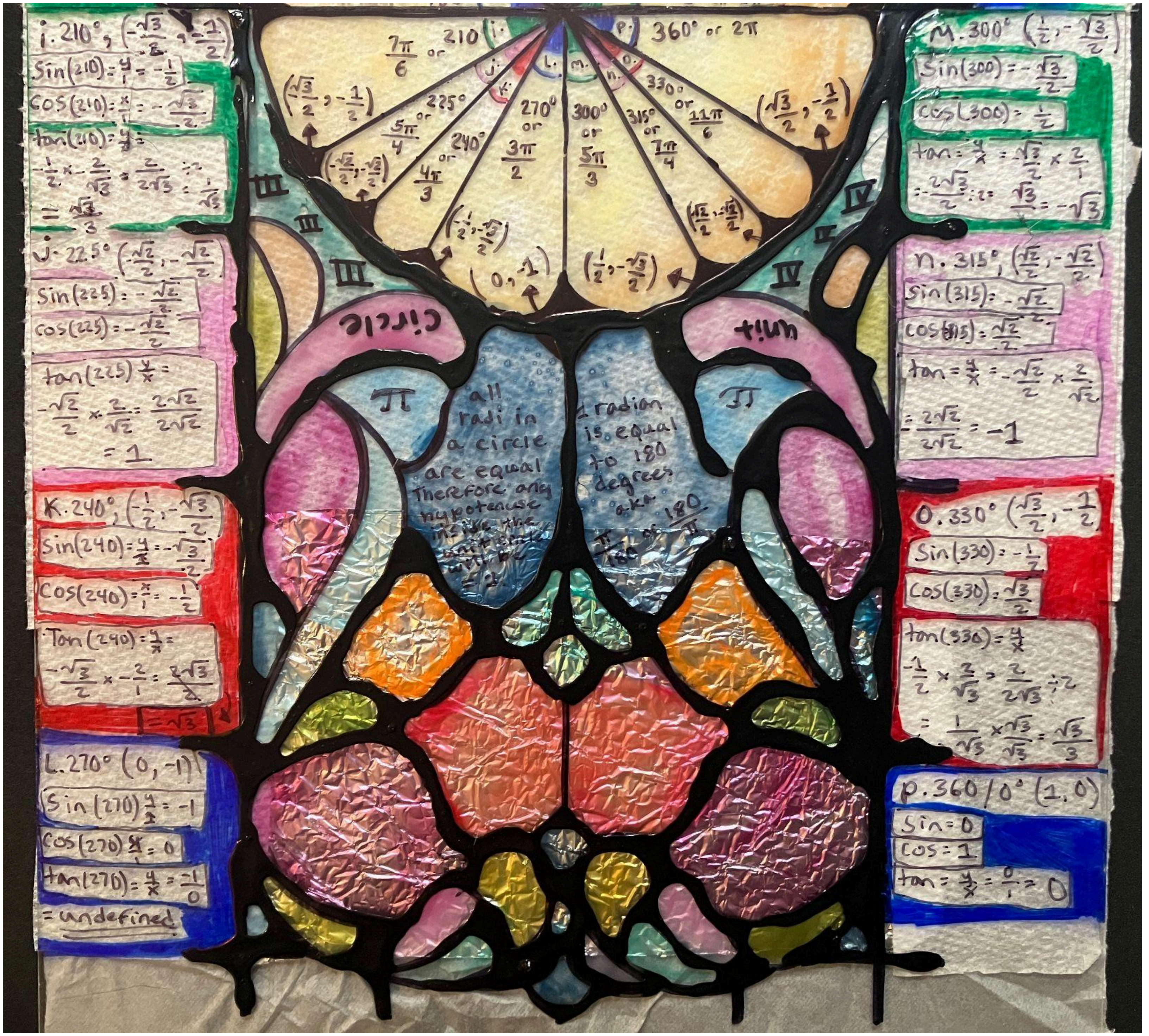


II
I
e. 120°, (-1/2, √3/2)
sin(120) = y/1 = √3/2
cos(120) = x/1 = -1/2
tan(120) = y/x =
f. 135°, (-√2/2, √2/2)
sin(135°) = √2/2
cos(135) = -√2/2
tan(135) = y/x =
g. 150°, (-√3/2, 1/2)
sin(150) = y/1 = 1/2
cos(150) = x/1 = -√3/2
tan(150) = y/x =
h. 180°, (-1, 0)
sine(180) = y/1 = 0
cos(180) = x/1 = -1
a. 30°, (√3/2, 1/2)
sin(30) = opp/hyp = 1/2 = y
cos(30) = adj/hyp = √3/2 = x
tan(30) = opp/adj = y/x = √3/3
b. 45°, (√2/2, √2/2)
sin(30°) = y/1 = √2/2
cos(30°) = x/1 = √2/2
c. 60°, (1/2, √3/2)
sin(60°) = y/1 = √3/2
cos(60°) = x/1 = 1/2
d. 90°, (0, 1)
sin(90) = y/1 = 1
cos(90) = x/1 = 0
tan(90) = y/x = 1/0 = undefined
m. 300° (1/2, -√3/2)
sin(300) = -√3/2
n. 315°, (√2/2, -√2/2)
o. 330° (√3/2, -1/2)
p. 360/0° (1, 0)
sin = 0
cos = 1
tan = y/x = 0/1 = 0
i. 210°, (-√3/2, -1/2)
j. 225° (-√2/2, -√2/2)
k. 240°, (-1/2, -√3/2)
L. 270° (0, -1)
= undefined
sin θ = y coordinate of the point intersecting the circle.
cos θ = x coordinate of the point intersecting the circle.
unit
circle
(0,1)
(-1,0)
(1,0)
(0,-1)
90°
120°
150°
180°
0° or 2π
360° or 2π
270°
300°
all radii in a circle are equal
1 radian is equal to 180 degrees

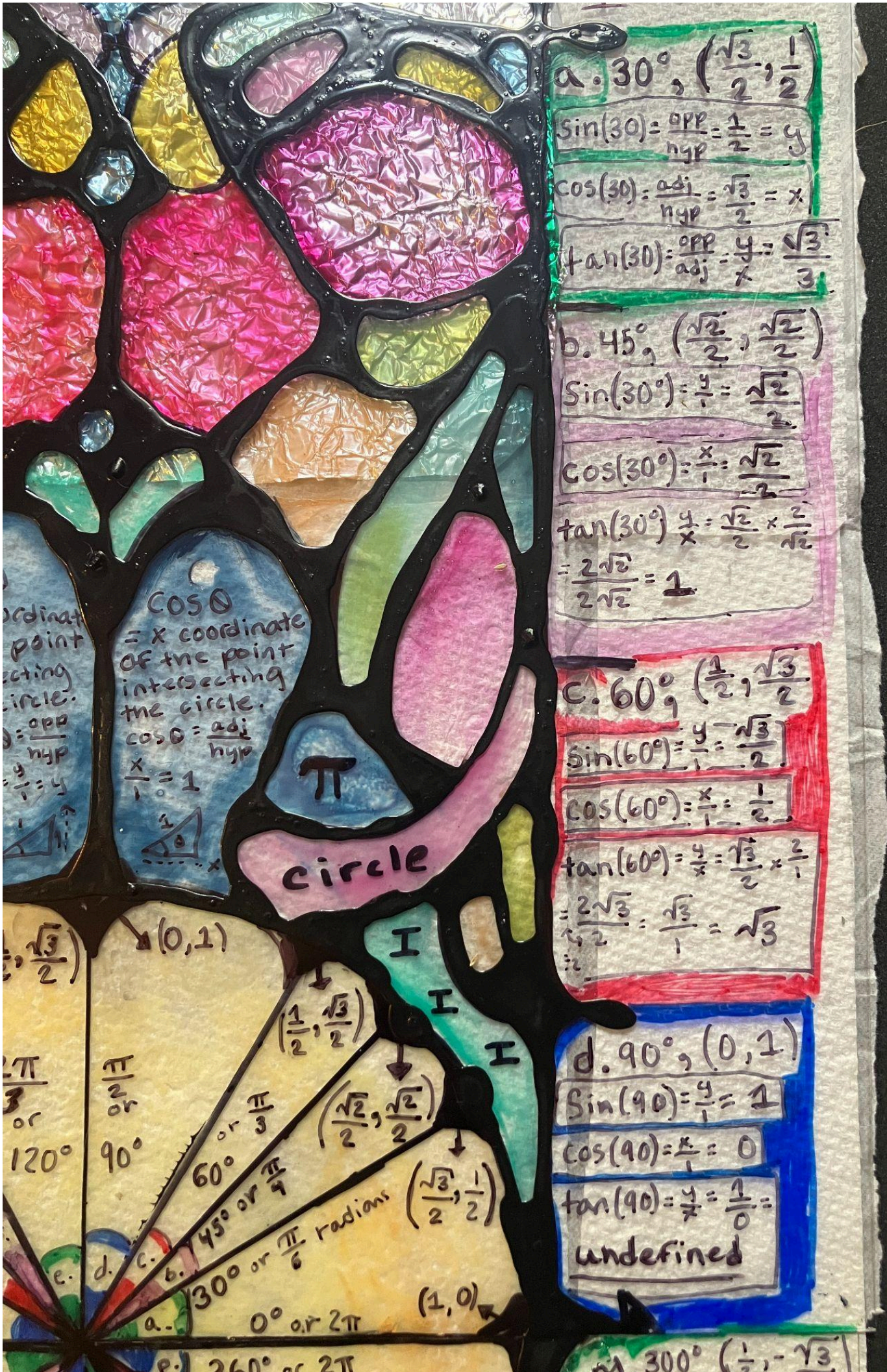


unit
circle
$\frac{y}{1} = y$
$\frac{x}{1} = 1$
I
II
III
IV
(0,1)
$\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
$\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$
$\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
(1,0)
$\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
$\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$
$\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
(-1,0)
$\left(-\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$
$\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$
$\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$
(0, -1)
$\left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$
$\left(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$
$\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$
$\frac{\pi}{2}$ or 90°
$\frac{2\pi}{3}$ or 120°
60° or $\frac{\pi}{3}$
45° or $\frac{\pi}{4}$
30° or $\frac{\pi}{6}$ radians
0° or 2π
$\frac{3\pi}{4}$ 135°
$\frac{5\pi}{6}$ 150°
π radian or 180°
210° or $\frac{7\pi}{6}$
225° or $\frac{5\pi}{4}$
240° or $\frac{4\pi}{3}$
270° or $\frac{3\pi}{2}$
300° or $\frac{5\pi}{3}$
315° or $\frac{7\pi}{4}$
330° or $\frac{11\pi}{6}$
360° or 2π
a. b. c. d. e. f. g. h. i. j. k. l. m. n. o. p.
all radi in a circle
1 radian is equal to 180

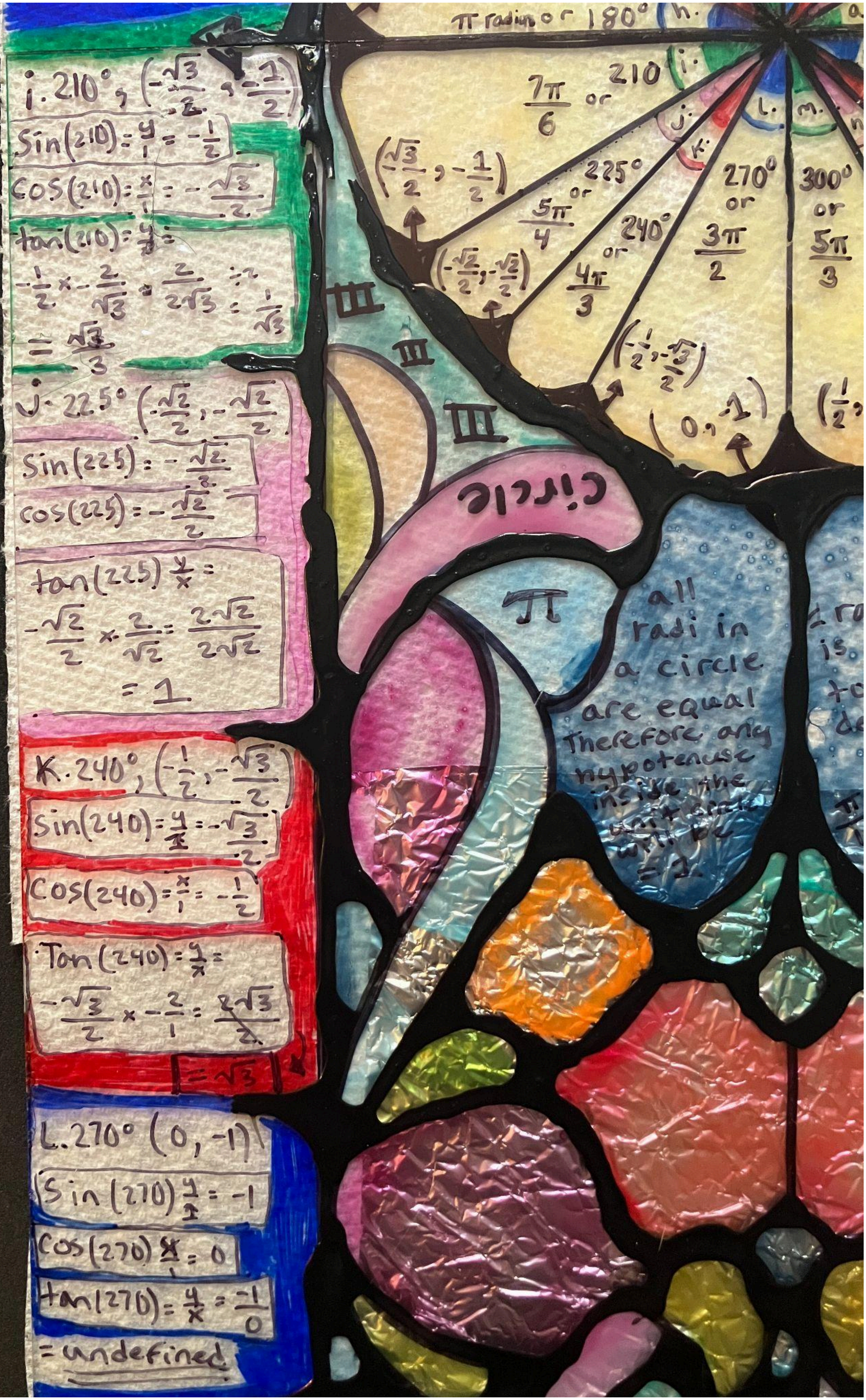

e. 120°, $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
$\sin(120) = \frac{y}{1} = \frac{\sqrt{3}}{2}$
$\cos(120) = \frac{x}{1} = -\frac{1}{2}$
$\tan(120) = \frac{y}{x} = \frac{\sqrt{3}}{2} \times -\frac{2}{1} = -\frac{2\sqrt{3}}{2} = -\sqrt{3}$
a. 30°, $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
$\sin(30) = \frac{opp}{hyp} = \frac{1}{2} = y$
$\cos(30) = \frac{adj}{hyp} = \frac{\sqrt{3}}{2} = x$
$\tan(30) = \frac{opp}{adj} = \frac{y}{x} = \frac{\sqrt{3}}{3}$
f. 135°, $\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$
$\sin(135°) = \frac{\sqrt{2}}{2}$
$\cos(135) = -\frac{\sqrt{2}}{2}$
$\tan(135) = \frac{1}{x} = \frac{\sqrt{2}}{2} \times \frac{2}{\sqrt{2}} = -\frac{2\sqrt{2}}{2\sqrt{2}} = -1$
b. 45°, $\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$
$\sin(30°) = \frac{y}{1} = \frac{\sqrt{2}}{2}$
$\cos(30°) = \frac{x}{1} = \frac{\sqrt{2}}{2}$
$\tan(30°) \frac{y}{x} = \frac{\sqrt{2}}{2} \times \frac{2}{\sqrt{2}} = \frac{2\sqrt{2}}{2\sqrt{2}} = 1$
g. 150°, $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
$\sin(150) = \frac{y}{1} = \frac{1}{2}$
$\cos(150) = \frac{x}{1} = -\frac{\sqrt{3}}{2}$
$\tan(150) = \frac{y}{x} = \frac{1}{2} \times -\frac{2}{\sqrt{3}} = -\frac{2}{2\sqrt{3}} = \frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$
Sin θ = y coordinate of the point intersecting the circle.
$\sin\theta = \frac{opp}{hyp}$
$y = \frac{y}{1} = y$
Cos θ = x coordinate of the point intersecting the circle.
$\cos\theta = \frac{adj}{hyp}$
$\frac{x}{1} = 1$
unit circle
c. 60°, $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
$\sin(60°) = \frac{y}{1} = \frac{\sqrt{3}}{2}$
$\cos(60°) = \frac{x}{1} = \frac{1}{2}$
$\tan(60°) = \frac{y}{x} = \frac{\sqrt{3}}{2} \times \frac{2}{1} = \frac{2\sqrt{3}}{2} = \frac{\sqrt{3}}{1} = \sqrt{3}$
h. 180°, (-1,0)
$\sin(180) = \frac{y}{1} = 0$
$\cos(180) = \frac{x}{1} = -1$
$\tan(180) = \frac{y}{x} = \frac{0}{-1} = 0$
d. 90°, (0,1)
$\sin(90) = \frac{y}{1} = 1$
$\cos(90) = \frac{x}{1} = 0$
$\tan(90) = \frac{y}{x} = \frac{1}{0} =$ undefined
II
I
III
IV
$\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
(0,1)
$\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$
$\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
$\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
$\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$
$\frac{2\pi}{3}$ or 120°
$\frac{\pi}{2}$ or 90°
$\frac{\pi}{3}$ or 60°
$\frac{3\pi}{4}$ 135°
$\frac{5\pi}{6}$ 150°
45° or $\frac{\pi}{4}$
$\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
30° or $\frac{\pi}{6}$ radians
(-1,0)
π radians or 180°
0° or 2π
(1,0)
a.
b.
c.
d.
e.
f.
g.
h.



i. 210°, $(-\frac{\sqrt{3}}{2}, -\frac{1}{2})$
Sin(210) = $\frac{y}{1}$ = $-\frac{1}{2}$
COS(210) = $\frac{x}{1}$ = $-\frac{\sqrt{3}}{2}$
tan(210) = $\frac{y}{x}$ =
$-\frac{1}{2} \times -\frac{2}{\sqrt{3}} = \frac{2}{2\sqrt{3}} \div \frac{1}{\sqrt{3}}$
$= \frac{\sqrt{3}}{3}$
j. 225° $(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2})$
Sin(225) = $-\frac{\sqrt{2}}{2}$
cos(225) = $-\frac{\sqrt{2}}{2}$
tan(225) $\frac{y}{x}$ =
$-\frac{\sqrt{2}}{2} \times \frac{2}{\sqrt{2}} = \frac{2\sqrt{2}}{2\sqrt{2}}$
= 1
K. 240°, $(-\frac{1}{2}, -\frac{\sqrt{3}}{2})$
Sin(240) = $\frac{y}{1}$ = $-\frac{\sqrt{3}}{2}$
COS(240) = $\frac{x}{1}$ = $-\frac{1}{2}$
Tan(240) = $\frac{y}{x}$ =
$-\frac{\sqrt{3}}{2} \times -\frac{2}{1} = \frac{2\sqrt{3}}{2}$
$= \sqrt{3}$
L. 270° (0, -1)
Sin(270) $\frac{y}{1}$ = -1
COS(270) $\frac{x}{1}$ = 0
tan(270) = $\frac{y}{x}$ = $\frac{-1}{0}$
= undefined
$\frac{7\pi}{6}$ or 210°
360° or 2π
$(-\frac{\sqrt{3}}{2}, -\frac{1}{2})$
225° or $\frac{5\pi}{4}$
240° or $\frac{4\pi}{3}$
270° or $\frac{3\pi}{2}$
300° or $\frac{5\pi}{3}$
315° or $\frac{7\pi}{4}$
330° or $\frac{11\pi}{6}$
$(\frac{\sqrt{3}}{2}, -\frac{1}{2})$
$(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2})$
$(-\frac{1}{2}, -\frac{\sqrt{3}}{2})$
(0, -1)
$(\frac{1}{2}, -\frac{\sqrt{3}}{2})$
$(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2})$
III
IV
circle
unit
π
all radi in a circle are equal Therefore any hypotenuse inside the unit circle will be = 1.
1 radian is equal to 180 degrees a.k.a $\frac{180}{\pi}$
M. 300° $(\frac{1}{2}, -\frac{\sqrt{3}}{2})$
Sin(300) = $-\frac{\sqrt{3}}{2}$
cos(300) = $\frac{1}{2}$
tan = $\frac{y}{x}$ = $-\frac{\sqrt{3}}{2} \times \frac{2}{1}$
$= -\frac{2\sqrt{3}}{2} \div 2 = -\frac{\sqrt{3}}{1} = -\sqrt{3}$
n. 315°, $(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2})$
Sin(315) = $-\frac{\sqrt{2}}{2}$
cos(315) = $\frac{\sqrt{2}}{2}$
tan = $\frac{y}{x}$ = $-\frac{\sqrt{2}}{2} \times \frac{2}{\sqrt{2}}$
$= \frac{2\sqrt{2}}{2\sqrt{2}} = -1$
O. 330° $(\frac{\sqrt{3}}{2}, -\frac{1}{2})$
Sin(330) = $-\frac{1}{2}$
Cos(330) = $\frac{\sqrt{3}}{2}$
tan(330) = $\frac{y}{x}$
$-\frac{1}{2} \times \frac{2}{\sqrt{3}} = \frac{2}{2\sqrt{3}} \div 2$
$= \frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$
p. 360/0° (1, 0)
Sin = 0
cos = 1
tan = $\frac{y}{x}$ = $\frac{0}{1}$ = 0


a. 30°, $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
$\sin(30) = \frac{opp}{hyp} = \frac{1}{2} = y$
$\cos(30) = \frac{adj}{hyp} = \frac{\sqrt{3}}{2} = x$
$\tan(30) = \frac{opp}{adj} = \frac{y}{x} = \frac{\sqrt{3}}{3}$
b. 45°, $\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$
$\sin(30°) = \frac{y}{1} = \frac{\sqrt{2}}{2}$
$\cos(30°) = \frac{x}{1} = \frac{\sqrt{2}}{2}$
$\tan(30°) \frac{y}{x} = \frac{\sqrt{2}}{2} \times \frac{2}{\sqrt{2}}$
$= \frac{2\sqrt{2}}{2\sqrt{2}} = 1$
c. 60°, $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
$\sin(60°) = \frac{y}{1} = \frac{\sqrt{3}}{2}$
$\cos(60°) = \frac{x}{1} = \frac{1}{2}$
$\tan(60°) = \frac{y}{x} = \frac{\sqrt{3}}{2} \times \frac{2}{1}$
$= \frac{2\sqrt{3}}{2} = \frac{\sqrt{3}}{1} = \sqrt{3}$
d. 90°, (0,1)
$\sin(90) = \frac{y}{1} = 1$
$\cos(90) = \frac{x}{1} = 0$
$\tan(90) = \frac{y}{x} = \frac{1}{0} =$
undefined
cos θ
= x coordinate of the point intersecting the circle.
$\cos\theta = \frac{adj}{hyp}$
$\frac{x}{1} = 1$
π
circle
I
I
I
(0,1)
$\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
$\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$
$\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
(1,0)
90° or $\frac{\pi}{2}$
60° or $\frac{\pi}{3}$
45° or $\frac{\pi}{4}$
30° or $\frac{\pi}{6}$ radians
0° or 2π
a.
b.
c.
d.
e.


e. 120°, (-1/2, √3/2)
sin(120) = y/1 = √3/2
cos(120) = x/1 = -1/2
tan(120) = y/x =
√3/2 × -2/1 = -2√3/2 = -√3
f. 135°, (-√2/2, √2/2)
sin(135°) = √2/2
cos(135) = -√2/2
tan(135) = y/x =
√2/2 × -2/√2 = -2√2/2√2 = -1
g. 150°, (-√3/2, 1/2)
sin(150) = y/1 = 1/2
cos(150) = x/1 = -√3/2
tan(150) = y/x =
1/2 × -2/√3 = -2/2√3
= -1/√3 × √3/√3 = -√3/3
h. 180°, (-1, 0)
sine(180) = y/1 = 0
cos(180) = x/1 = -1
tan(180) = y/x = 0/-1
= 0
sin θ
= y coordinate of the point intersecting the circle.
sin θ = opp/hyp
y = y/1 = y
π
unit
II
II
II
(-1/2, √3/2)
(-√2/2, √2/2)
(-√3/2, 1/2)
2π/3 or 120°
π/2 or 90°
3π/4
135°
5π/6
150°
(-1, 0)
π radians or 180°
f.
g.
h.
e.
d.
c.
b.
a.



π radians or 180°
7π/6 or 210
(√3/2, -1/2)
225° or 5π/4
(-√2/2, -√2/2)
240° or 4π/3
270° or 3π/2
300° or 5π/3
(-1/2, -√3/2)
(0, -1)
i. 210°, (-√3/2, -1/2)
Sin(210) = y/1 = -1/2
cos(210) = x/1 = -√3/2
tan(210) = y/x = -1/2 × -2/√3 = 2/2√3 = 1/√3 = √3/3
j. 225° (-√2/2, -√2/2)
Sin(225) = -√2/2
cos(225) = -√2/2
tan(225) y/x = -√2/2 × 2/√2 = 2√2/2√2 = 1
K. 240°, (-1/2, -√3/2)
Sin(240) = y/1 = -√3/2
cos(240) = x/1 = -1/2
Tan(240) = y/x = -√3/2 × -2/1 = 2√3/2 = √3
L. 270° (0, -1)
Sin(270) y/1 = -1
cos(270) x/1 = 0
tan(270) = y/x = -1/0 = undefined
III
circle
π
all radi in a circle are equal Therefore any hypotenuse inside the unit circle will be = 1.


0° or 2π
360° or 2π
270° or 3π/2
300° or 5π/3
315° or 7π/4
330° or 11π/6
(√3/2, -1/2)
(√2/2, -√2/2)
(1/2, -√3/2)
IV
IV
unit
1 radian is equal to 180 degrees aka 180/π or π/180
M. 300° (1/2, -√3/2)
Sin(300) = -√3/2
cos(300) = 1/2
tan = y/x = -√3/2 × 2/1
= -2√3/2 ÷ 2 = √3 = -√3
n. 315°, (√2/2, -√2/2)
Sin(315) = -√2/2
cos(315) = √2/2
tan = y/x = -√2/2 × 2/√2
= 2√2/2√2 = -1
O. 330° (√3/2, -1/2)
Sin(330) = -1/2
Cos(330) = √3/2
tan(330) = y/x
-1/2 × 2/√3 = 2/2√3 ÷ 2
= 1/√3 × √3/√3 = √3/3
p. 360/0° (1,0)
Sin = 0
cos = 1
tan = y/x = 0/1 = 0