Piping Formulas

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HOW TO DETERMINE WRENCH SIZE :

Formula:

- STUD SIZE X 1.5 + 1/8"

Ex: 3/4 → 3/4 = 6/8

(3/4 X 1.5) + 1/8 = 1.25 or 1 1/4

- STUD SIZE X 1.5 + 3 mm

Ex: 19 mm

(19 X 1.5) + 3 mm = 31.5

32 mm

⊙ BRANCH HOLE "Y"

SHIFT tan⁻¹ ((Bir × Sin(θ)) ÷ Hor − S.D. OF "T")) = Answer

(Answer) θ × Hor × Cos 89° =

HORIZONTAL LINES DISTANCE

$$\sqrt{((Bir \times (1 - \cos(\theta)))^2 + S.D.\ "Y"\ 2)} =$$

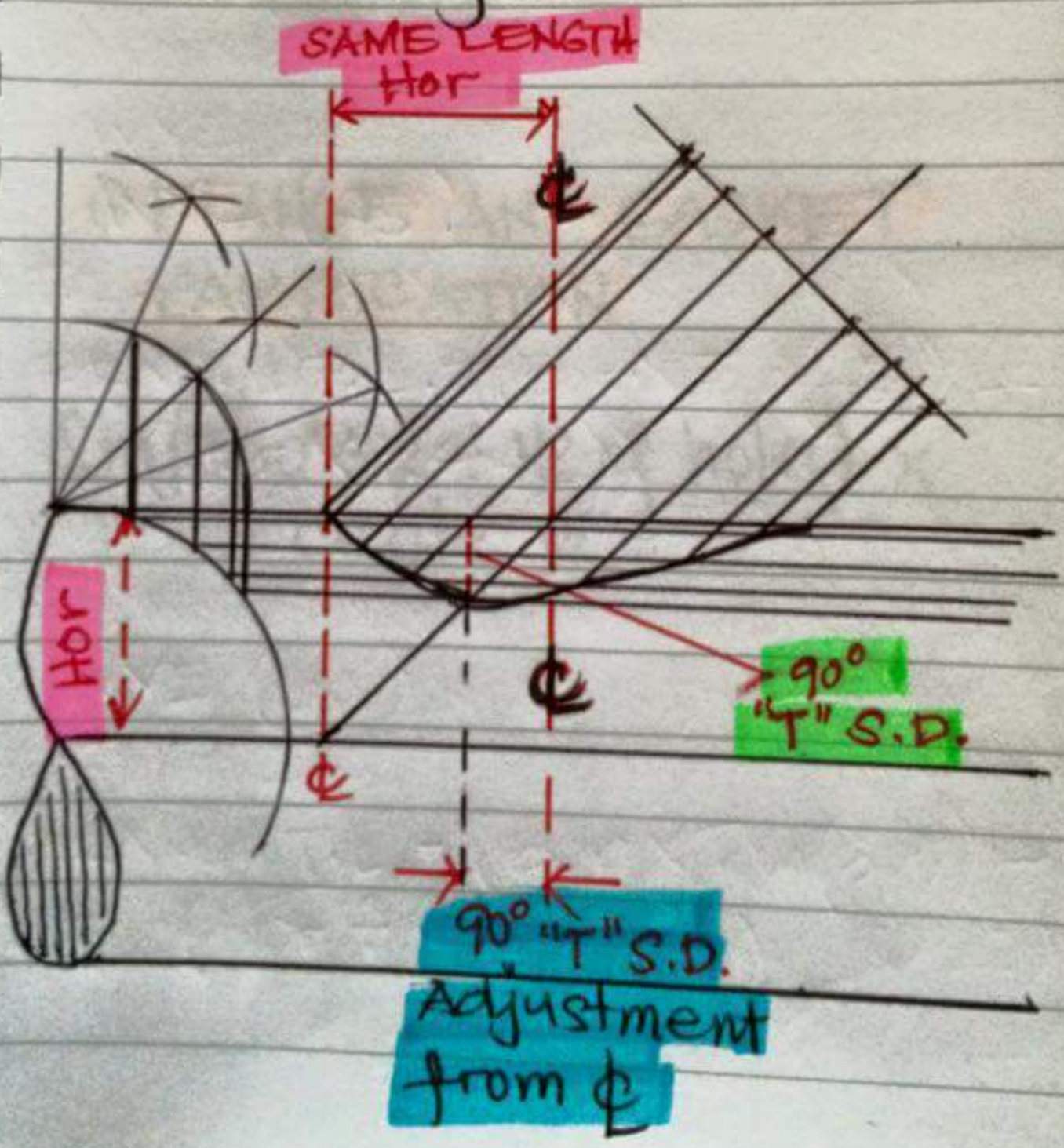
$$\sqrt{(Answer^2 - S.D.\ OF\ "T")} =$$

VERTICAL LINES DISTANCE

⊙ MATCHING CENTRE LINES OF BRANCH AND HEADER

*45° LATERAL WYE

Hor - Longest S.D. of "T"



OLD WAYS: 45° ELBOW

EX:

① N.P.S. X 5/8

8" X 5/8 = 5"

5" X 25.4 = 127 mm

② N.P.S. X .625

8" X 25.4 = 203.2 mm

203.2 X .625 = 127 mm

NEW WAY:

N.P.S X 15.875 =

EX: 8" X 15.875 = 127 mm

5/8
OR
.625
X 25.4 = 15.875

⊙ BRANCH LENGTH TO BE CUT

TEE

T.L. = Hor + Length of 90° S.D.

WYE

T.L. = ((Bor × Tan(45°)) + (Hor × 1.4142)) + Longest S.D. of "y"

⊙ HOW TO DEVIDE PIPE'S CIRCUMFERENCE INTO EQUAL SPACES

(1 + O.D.) × π ÷ (8, 16 OR 32)

↓

DEPENDENT ON PIPE SIZE

⊙BRANCH FABRICATION

ABBREVATIONS:

Ⓐ Hor = Header outside radius
Ⓑ Bir = Branch inside radius
Ⓒ Bor = Branch outside radius
ⓓ O.D. = Outside Diametre
Ⓔ S.D. = Saddle Depth
Ⓕ T.L. = True Length

⊙Tee (T)

$$Hor - \sqrt{(Hor^2 - (Bir \times Sin(\theta))^2)}$$

★ BRANCH HOLE

SHIFT Tan⁻¹ ((Bir × Sin(θ)) ÷ (Hor − S.D Tee)) = Answer

θ × Hor × Cos 89° = Horizontal LINE DISTANCE
(Answer)

① AREA OF SQUARE OR RECTANGLE:

$A = S^2$
$= S \times S$

OR

$A = LW$
$= L \times W$

$$\text{Width} = \frac{A}{L}$$

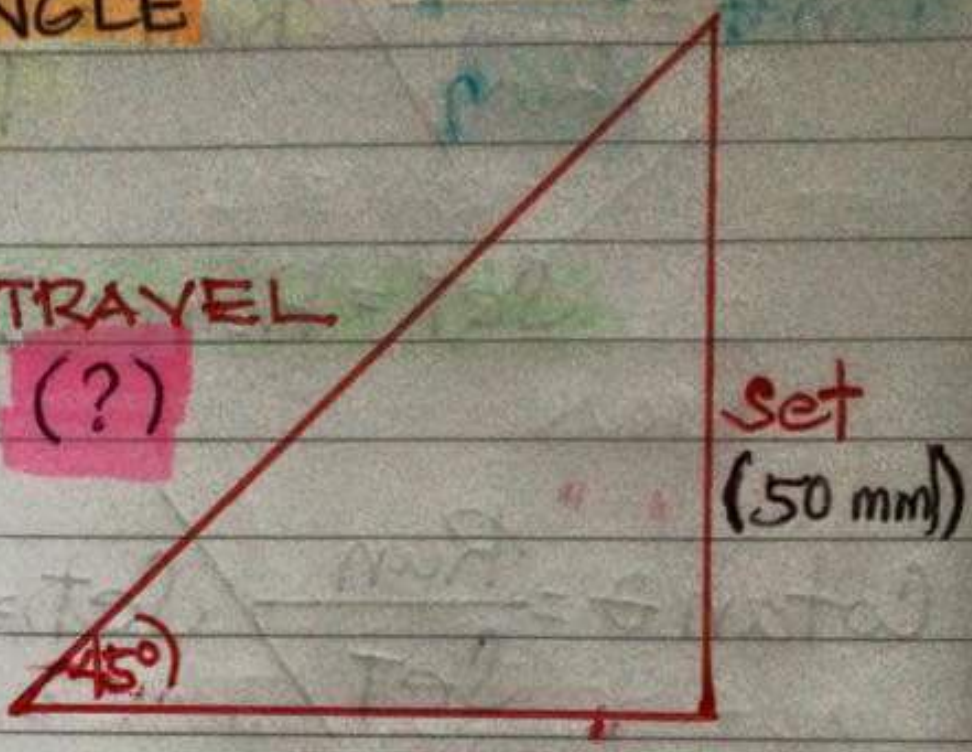
$$\text{Length} = \frac{A}{W}$$

② AREA OF A CIRCLE

① $A = \pi r^2$
$= \pi \left(\frac{d}{2}\right)^2$

② $A = .7854 \times d^2$
$= .7854 \times d \times d$

⊙ TO FIND "TRAVEL" OF 45° ANGLE



$$\text{Cosecant } 45° = \frac{\text{Travel}}{\text{Set}}$$

$$\text{Travel} = \text{Set} \times \text{Cosecant } 45°$$

$$= \text{Set} \times 1.4142$$

$$= 50\text{mm} \times 1.4142$$

$$= 70.71\text{mm}$$

⊙STAGGERING OFFSET

℄ TO ℄ DISTANCE OF PIPE
X Tan (Θ TURN OFFSET ÷ 2)

⊙MITER CUT OF PIPE

PIPE O.D. X Tan (Θ OF CUT)

⊙CUT BACK OF ANGLE BAR

WIDTH - THICKNESS X
Tan (Θ OF CUT)

⊙COMPUTATION FOR ORDINATE LINES AND LENGTH

#4 = r OF PIPE
#1 = L OF #4 X Sine (22.5°)
#2 = L OF #4 X Sine (45°)
#3 = L OF #4 X Sine (67.5°)

★SAMPLE ON NEXT PAGE★

$$\text{Cosecant}\,\theta = \frac{\text{Travel}}{\text{Set}} \qquad \text{Set} = \frac{\text{Travel}}{\text{Cosecant}\,\theta}$$

$$\text{Travel} = \text{Set} \times \text{Cosecant}\,\theta$$

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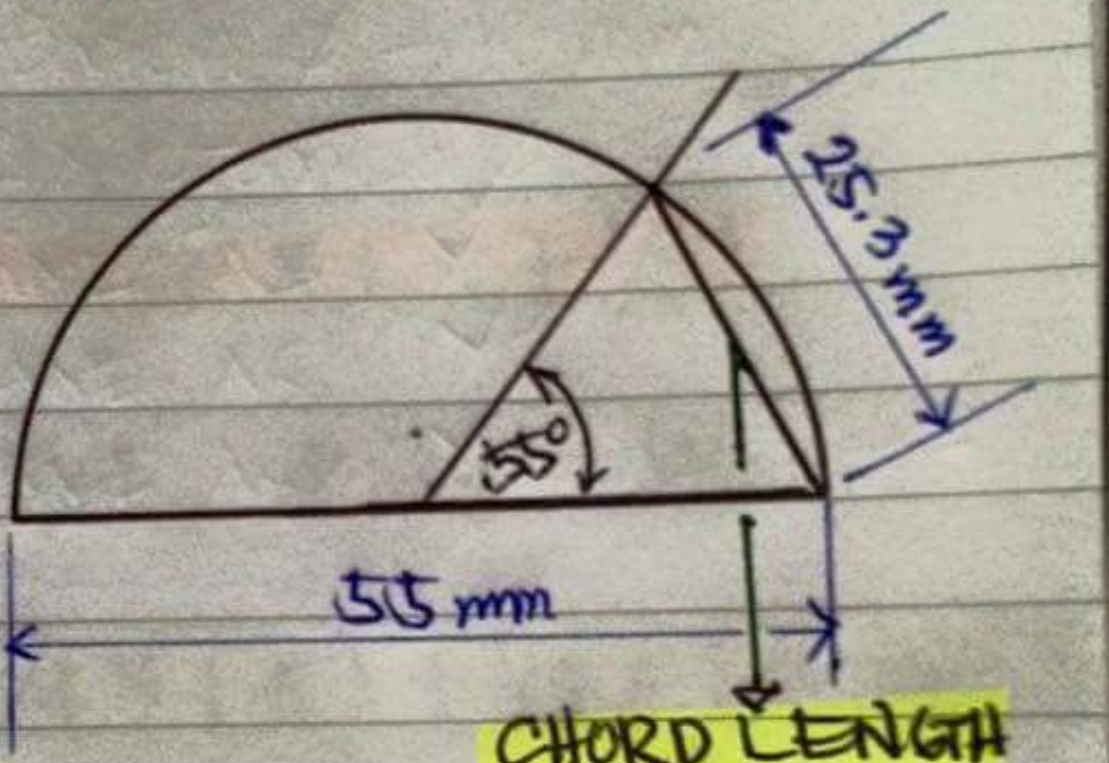
⊙ PHYTAGOREAN THEOREM

$$T = \sqrt{S^2 + R^2}$$

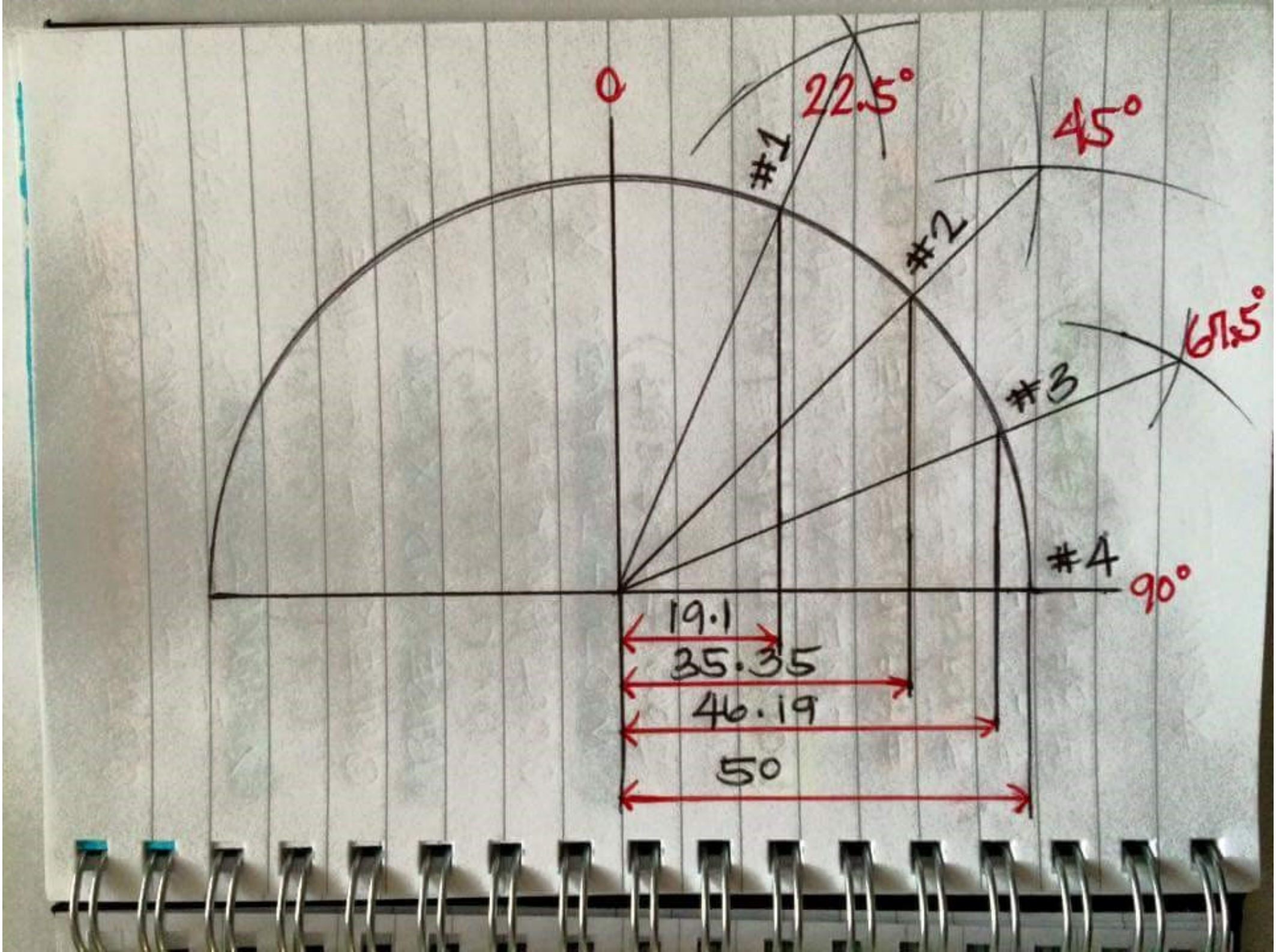
$$R = \sqrt{T^2 - S^2}$$

$$S = \sqrt{T^2 - R^2}$$

FORMULA TO FIND CHORD LENGTH:



- $\emptyset \times \text{SINE}(\theta \div 2)$


0
22.5°
45°
67.5°
90°
#1
#2
#3
#4
19.1
35.35
46.19
50

HOW TO DETERMINE WRENCH SIZE :

Formula:

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- STUD SIZE X 1.5 X 3 mm

Ex: 19 mm

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⊙ ABOUT THE CIRCLE

① ARC LENGTH

$r \times \theta \times \cos 89°$

② Degrees of Arc

$D \div (r \times \cos 89°)$

③ Radius of Arc

$D \div (\theta \times \cos 89°)$

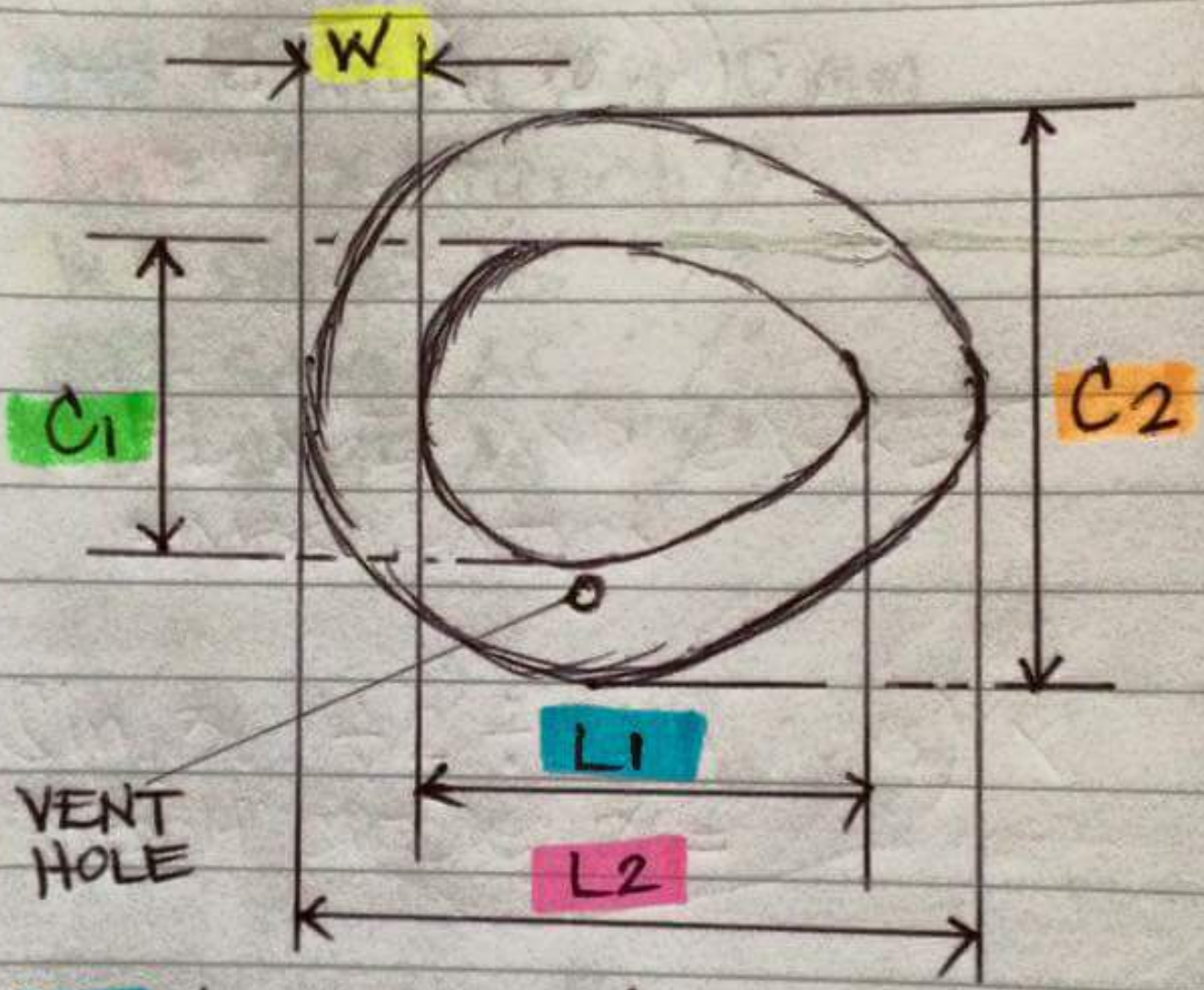
Note: D = Arc Length

⊙ CIRCUMFERENCE OF PIPE

$\phi \times \pi$ (3.1416)

⊙ REINFORCING PAD FOR:

★ 45° LATERAL "Y"



L_1 = branch ø ÷ cos 45° + 10 mm

L_2 = (2 × branch ø) ÷ cos 45°

$W = (L_1 - L_2) \div 2$

C_1 = Hor × $\sin^{-1}$ (Bor ÷ Hor) × (π ÷ 180) + 10 mm

$C_2 = C_1 + (2 \times W)$

$$\tan\theta = \frac{Set}{Run} \quad / \quad Run = \frac{Set}{\tan\theta}$$

$$Set = Run \times \tan\theta$$

$$\text{Cotan}\,\theta = \frac{Run}{Set} \quad / \quad Set = \frac{Run}{\text{Cotan}\,\theta}$$

$$Run = Set \times \text{Cotan}\,\theta$$

$$\text{Secant}\,\theta = \frac{Travel}{Run} \quad / \quad Run = \frac{Travel}{\text{Secant}\,\theta}$$

$$Travel = Run \times \text{Secant}\,\theta$$

⊙ HOW TO FIND THE TAKE-OFF OF A 90° AND 45° ELBOW

OLD WAYS : 90° LR

N.P.S. X 1.5

EX. ① 8" X 25.4 = 203.2 mm

203.2 X 1.5 = 304.8 mm

② 8" X 1 1/2 = 12"

12" X 25.4 = 304.8 mm

NEW WAY :

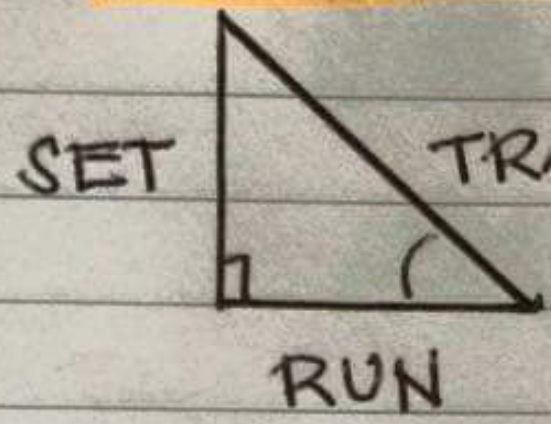
NPS X 38.1

EX:

8" X 38.1 = 304.8 mm

1.5 OR 1 1/2 X 25.4 = 38.1

⊙ TRIGONOMETRIC FUNCTION AND FORMULAS:



$$\text{Sine}\,\theta = \frac{\text{Set}}{\text{TRAVEL}} \Big/ \text{TRAVEL} = \frac{\text{Set}}{\text{Sine}\,\theta}$$

$$\text{Set} = \text{Travel} \times \text{Sine}\,\theta$$

$$\text{Cosine}\,\theta = \frac{\text{Run}}{\text{Travel}} \Big/ \text{Travel} = \frac{\text{Run}}{\text{Cosine}\,\theta}$$

$$\text{Run} = \text{Travel} \times \text{Cosine}\,\theta$$

⊙ BRANCH WRAP-AROUND LINE

TEE

Branch T.L. − Hor =

WYE (45°)

BRANCH T.L. − ((Bor X Tan(45°)) + (Hor X 1.4142))

WYE (60°)

BRANCH T.L. − ((Bor X Tan(30°)) + (Hor ÷ Cos(30°)))

★SADDLE "T"

L_1 = Branch ø + 10 mm

L_2 = 2 x Branch ø

W = SAME AS "Y"

C_1 = SAME AS "Y"

C_2 = SAME AS "Y"

ROLLED OFFSET

(#) $r \times \theta \times \cos 89°$

MITERING

① BACK OF ELBOW $\div 90 \times \theta$
NECK OF ELBOW $\div 90 \times \theta$

② $r \times \theta \times \cos 89°$

TAKE OFF OF AN OFFSET ELBOW

① $\tan(\theta \div 2) \times 38.1 \times \phi$ (INCH)

② $\tan(\theta \div 2) \times 1.5 \times \phi$ (mm)

⊙ FORMULA ON SOLVING:

Secant = $1 \div \text{Sine}\,(90-\theta)$

Cosecant = $1 \div \text{Cosine}\,(90-\theta)$

⊙ CONVERSIONS ⊙

1 INCH = 25.4 mm
1 METRE = 3.28 FT
1 FT = 30.48 Cm
1 FT = 304.8 mm
1 METRE = 39.37 INCHES
1 Cm = .3937 INCHES

Bir X Sine (θ) =
VERTICAL LINES DISTANCE

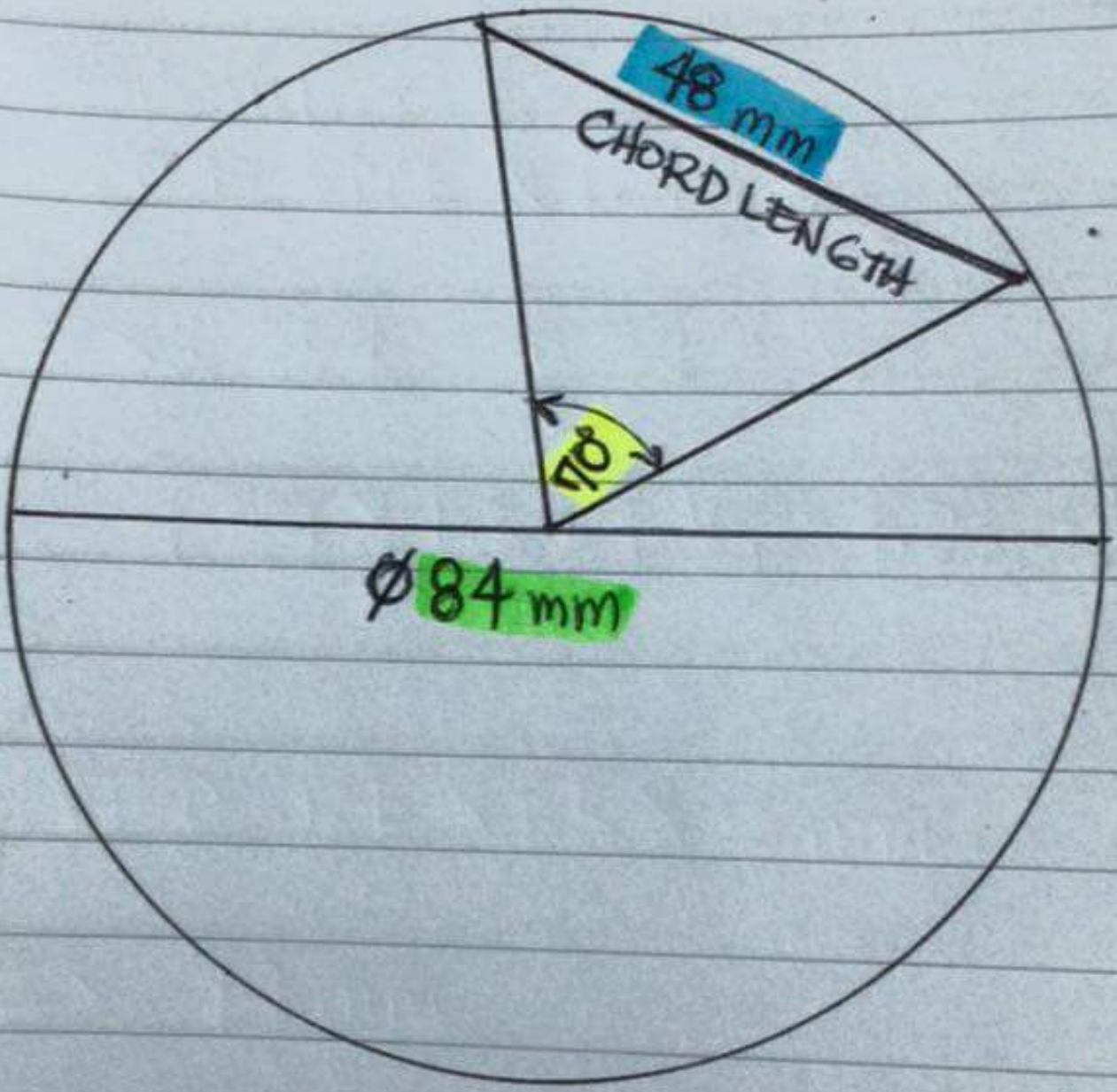
NOTE:
SYMBOL THETA (θ) IS CHANGABLE. THIS COMES FROM THE ORDINATE LINES (22.5° - 90°)

◎ LATERAL WYE (Y)

① $Hor - \sqrt{(Hor - (Bir \times Sin(\theta))^2)}$
$= 90°$ S.D

S.D. $\div Sin(45°) + Bir \times (1 - Cos(\theta)) \div Tan(45°) =$ S.D. (45° "Y")

FORMULA TO FIND CHORD LENGTH:



FORMULA: $Ø \times \text{Sine}(\theta \div 2)$

$84\text{mm} \times \text{Sine}(70 \div 2) =$

48 mm