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Tugas : Problem Set 1.2 No. 3 – 26 dan No. 35 – 44

Problem Set 1.3 No. 15 – 40

Date

3 $x-7 < 2x-5$

$\Rightarrow -x < 2$

$x > -2 \Rightarrow (-2, \infty)$

4) $3x-5 < 4x-6$

$\Rightarrow -x < -1$

$x > 1 \Rightarrow (1, \infty)$

5 $7x-2 \leq 9x+3$

$\Rightarrow -2x \leq 5$

$x \geq -\frac{5}{2} \quad [-\frac{5}{2}, \infty)$

6 $5x-3 > 6x-4$

$\Rightarrow -x > -1$

$x < 1 \quad (-\infty, 1)$

7 $-4 < 3x+2 < 5$

$-6 < 3x < 3 \Rightarrow -2 < x < 1 \quad (-2, 1)$

8 $-3 < 4x-9 < 11$

$\frac{3}{2} < x < 5 \quad (\frac{3}{2}, 5)$

9 $-3 < 1-6x \leq 4$

$\frac{2}{3} > x \geq -\frac{1}{2} \Rightarrow -\frac{1}{2} \leq x < \frac{2}{3} \quad [-\frac{1}{2}, \frac{2}{3})$

10 $4 < 5-3x < 7$

$-\frac{2}{3} < x < \frac{1}{3} \Rightarrow (-\frac{2}{3}, \frac{1}{3})$

11 $x^2 + 2x - 12 < 0$

$\Rightarrow x_1 = \frac{-2 + \sqrt{4+48}}{2} \Rightarrow x_1 = \frac{-2+2\sqrt{13}}{2}$

$\Rightarrow x_1 = -1 + \sqrt{13}$

$x_2 = -1 - \sqrt{13}$

$(x + 1 - \sqrt{13})(x + 1 + \sqrt{13}) < 0$

$x = 0$

$(1 - \sqrt{13})(1 + \sqrt{13}) < 0$

$1 - 13 < 0$

$\Rightarrow -1 - \sqrt{13} < x < -1 + \sqrt{13}$

$(-1 - \sqrt{13}, -1 + \sqrt{13})$

12 $x^2 - 5x - 6 \geq 0$

$\Rightarrow (x-6)(x+1) \geq 0$

•) $x = 0$

$-6 \geq 0$ (YM)

•) $x = -2$

$(-8)(-1) \geq 0 \Rightarrow 8 \geq 0$

•) $x = 7$

$(1)(8) \geq 0$

$\Rightarrow x \leq -1 \cup x \geq 6$

$(-\infty, -1] \cup [6, \infty)$

13 $2x^2 + 5x - 3 \geq 0$

$\Rightarrow (2x-1)(x+3) \geq 0$

•) $x = 0$

$\Rightarrow (-1)(3) \geq 0$ (YM)

$x \leq -3 \cup x \geq \frac{1}{2} \Rightarrow (-\infty, -3] \cup [\frac{1}{2}, \infty)$

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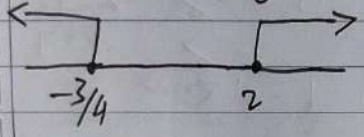
14 $4x^2 - 5x - 6 \geq 0$

$\Rightarrow x_1 = \frac{5 + \sqrt{25+96}}{8} \Rightarrow x_1 = \frac{5+\sqrt{121}}{8}$

$\Rightarrow x_1 = 2$

$\Rightarrow x_2 = \frac{-6}{8} \Rightarrow x_2 = -\frac{3}{4}.$



·) $x = 0$

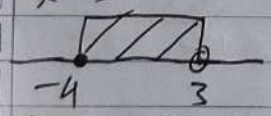
$(x-2)(x+\frac{3}{4}) \geq 0$

$(-2)(\frac{3}{4}) \geq 0$ (TM

$x \leq -\frac{3}{4} \cup x \geq 2$

$(-\infty, -\frac{3}{4}] \cup [2, \infty)$

15 $\frac{x+4}{x-3} \leq 0$



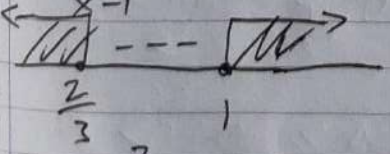
·) $x = 0 \Rightarrow \frac{4}{-3} \leq 0$

$-4 \leq x < 3 \Rightarrow [-4, 3)$

16 $\frac{3x-2}{x-1} \geq 0$

·) $x = 2$

$4 \geq 0$



$x \leq \frac{2}{3} \cup x \geq 1,$

$(-\infty, \frac{2}{3}] \cup [1, \infty).$

17 $\frac{2}{x} < 5$ ~~$\Rightarrow \frac{x}{2} < \frac{1}{5}$~~.

$x > \frac{2}{5}$ $\cup$ $x < 0$

$(\frac{2}{5}, \infty)$ $\cup$ $(-\infty, 0)$

18 $\frac{7}{4x} \leq 7$

$x \geq \frac{1}{4}$ $\cup$ $x < 0$

$[\frac{1}{4}, \infty)$ $\cup$ $(-\infty, 0)$.

19 $\frac{1}{3x-2} \leq 4$

~~$12x - 8 \geq 1 \Rightarrow$~~

$\frac{1-12x+8}{3x-2} \leq 0$

$\frac{-12x+9}{3x-2} \leq 0$

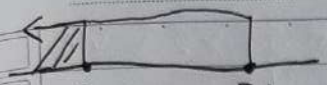
$-12x+9 \leq 0 \Rightarrow x \geq \frac{9}{12} \Rightarrow x \geq \frac{3}{4}$

$3x-2 > 0 \Rightarrow x > \frac{2}{3}$

$-12x+9 \geq 0 \Rightarrow x \leq \frac{3}{4}$

$3x-2 < 0 \Rightarrow x < \frac{2}{3}$

$x \geq \frac{3}{4}$



$x < \frac{2}{3} \cup x \geq \frac{3}{4}$

$(-\infty, \frac{2}{3}) \cup [\frac{3}{4}, \infty)$.

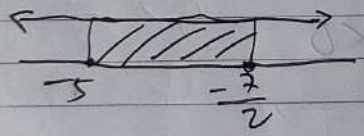
20 $\frac{3}{x+5} \geq 2$

$\frac{3-2x-10}{x+5} \geq 0$

$\frac{-2x-7}{x+5} \geq 0$

•) $-2x-7 \geq 0 \Rightarrow x \leq \frac{-7}{2}$

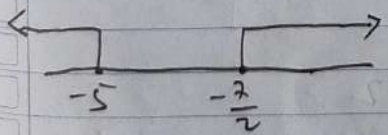
$x+5 \geq 0 \Rightarrow x \geq -5$



$-5 < x \leq -\frac{7}{2}$.

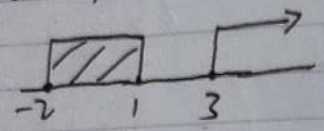
•) $-2x-7 < 0 \Rightarrow x \geq -\frac{7}{2}$

$x+5 < 0 \Rightarrow x < -5$



penyelesaian : $-5 < x \leq -\frac{7}{2} \Rightarrow (-5, -\frac{7}{2}]$.

21 $(x+2)(x-1)(x-3) > 0$

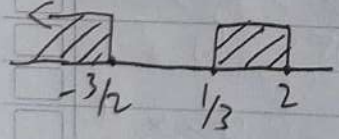


- $x = -3$
  $(-)(-)(-) > 0$ (TM)
- $x = 0$
  $(+)(-)(-) > 0$
- $x = 2$
  $(+)(+)(-) < 0$
- $x = 4$
  $(+)(+)(+) > 0$

$-2 < x < 1 \quad \cup \quad x > 3$

$(-2, 1) \cup (3, \infty)$

22 $(2x+3)(3x-1)(x-2) < 0$



- $x = -2$
  $(-)(-)(-) < 0$
- $x = 1/2$
  $(+)(+)(-) < 0$

$x < -\frac{3}{2} \cup 1/3 < x < 2$

$(-\infty, -\frac{3}{2}) \cup (1/3, 2)$.

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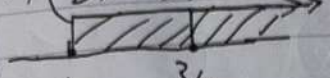
23 $(2x-3)(x-1)^2(x-3) \geq 0$

•) $(2x-3)(x-1)(x-1) \geq 0$



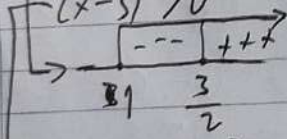
$x \geq \frac{3}{2}$ ∪ $x \geq 1$

$[\frac{3}{2}, \infty)$ ∪ $(1, \infty)$

24 $(2x-3)(x-1)^2(x-3) > 0$

•) $(2x-3)(x-1)^2 > 0$

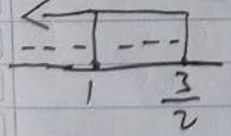
$(x-3) > 0$



$x > \frac{3}{2}$ $(\frac{3}{2}, \infty)$

$x > 3$ $(3, \infty)$ #

•) $(2x-3)(x-1)^2 < 0$



$x < 1$ ∪ $1 < x < \frac{3}{2}$

$(-\infty, 1)$ ∪ $(1, \frac{3}{2})$

$x - 3 < 0 \Rightarrow x < 3$

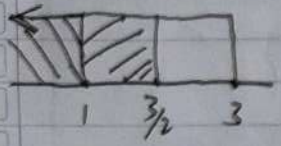
*) $x > 3$

$x > \frac{3}{2}$

$x > 3$ $(3, \infty)$.

*) $x<1 \cup 1<x<\frac{3}{2}$

$x<3$



$x<1 \cup 1<x<\frac{3}{2}$

$(-\infty, 1) \cup (1, \frac{3}{2})$.

Solution: $(3, \infty) \cup (-\infty, 1) \cup (1, \frac{3}{2})$

25 $x^3 - 5x^2 - 6x < 0$

$x(x^2 - 5x - 6) < 0$

$x(x+1)(x-6) < 0$

•) $x > 0$

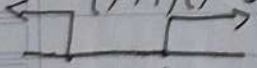
$(x+1)(x-6) < 0$

$(-1, 6)$, $x > 0$ 

$(0, 6)$

•) $x < 0$

$(x+1)(x-6) > 0$



$(-\infty, -1) \cup (6, \infty)$

$(-\infty, -1) \cup (0, 6)$

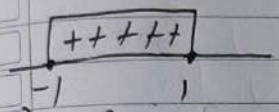
26 $x^3 - x^2 - x + 1 > 0$

$(x^3 - x^2) - (x - 1) > 0$

$x^2(x-1) - (x-1) > 0$

$(x-1)(x^2-1) > 0$

$(x-1)(x-1)(x+1) > 0$



- $x = 0$: $(-)(-)(+) > 0$
- $x = 2$: $(+)(+)(+) > 0$
- $x = -2$: $(-)(-)(-) < 0$

$\Rightarrow -1 < x < 1 \cup x > 1$

$(-1, 1) \cup (1, \infty)$

35 $|x-2| \geq 5$

$\Rightarrow x - 2 \leq -5 \cup x - 2 \geq 5$

$x \leq -3 \cup x \geq 7$

$(-\infty, -3] \cup [7, \infty)$

36 $|x+2| < 1$

$\Rightarrow -1 < x + 2 < 1 \Rightarrow -3 < x < -1 \Rightarrow (-3, -1)$

37 $|4x+5| \leq 10$

$-10 \leq 4x + 5 \leq 10$

$\frac{-15}{4} \leq x \leq \frac{5}{4} \Rightarrow \left[\frac{-15}{4}, \frac{5}{4}\right]$

38 $|2x-1| \geq 2$

$2x-1 \leq -2 \cup 2x-1 \geq 2$

$x \leq -\frac{1}{2} \cup x \geq \frac{3}{2}$

$(-\infty, -\frac{1}{2}] \cup [\frac{3}{2}, \infty)$.

39 $|\frac{2}{7}x-5| \geq 7$

$\frac{2}{7}x-5 \leq -7 \cup \frac{2}{7}x-5 \geq 7$

$x \leq -7 \cup x \geq 42$.

$(-\infty, -7] \cup [42, \infty)$

40 $|\frac{x}{4}+1| < 1$

$-1 < \frac{x}{4}+1 < 1$

$-8 < x < 0 \Rightarrow (-8, 0)$

41 $|5x-6| \geq 1$

$5x-6 \leq -1 \cup 5x-6 \geq 1$

$x \leq \frac{5}{5} \cup x \geq \frac{7}{5}$

$(-\infty, 1] \cup [\frac{7}{5}, \infty)$

42 $|2x-7| \geq 3$

$\Rightarrow 2x-7 \leq -3 \cup 2x-7 \geq 3$

$x \leq 2 \cup x \geq 5$

$(-\infty, 2] \cup [5, \infty)$.

43 $|\frac{1}{x}$ $\Rightarrow$

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43 $\left|\frac{1}{x}-3\right| \geq 6$

$\Rightarrow$ •) $\frac{1}{x}-3 < -6$

$\frac{1+3x}{x} < 0$.

•) $1+3x < 0 \Rightarrow x < -\frac{1}{3}$.

$x > 0$

$-\frac{1}{3}$ 0

•) $1+3x > 0 \Rightarrow x > -\frac{1}{3}$.

$x < 0$

$-\frac{1}{3}$ 0

$(-\frac{1}{3}, 0)$.

•) $\frac{1}{x}-3 \geq 6$

$\frac{1-9x}{x} \geq 0$

•) $1-9x \geq 0 \Rightarrow x \leq \frac{1}{9}$

~~$x < 0$~~ $x > 0$

0 $\frac{1}{9}$

~~$(-\infty, 0)$~~ $(0, \frac{1}{9}]$

•) $1-9x < 0 \Rightarrow x > \frac{1}{9}$.

~~$x \geq 0$~~ $x < 0$

0 $\frac{1}{9}$

$\Rightarrow (-\frac{1}{3}, 0) \cup (0, \frac{1}{9})$.

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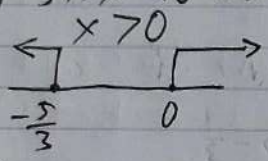
44 $|2+\frac{5}{x}|>1$

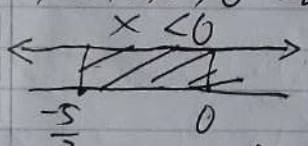
*) $2+\frac{5}{x}<-1$

$\frac{5+3x}{x}<0$

•) $5+3x<0 \Rightarrow x<-\frac{5}{3}$



•) $5+3x>0 \Rightarrow x>-\frac{5}{3}$.

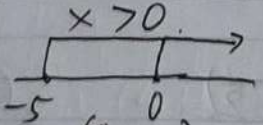


$\Rightarrow (-\frac{5}{3}, 0)$.

**) $2+\frac{5}{x}>1$

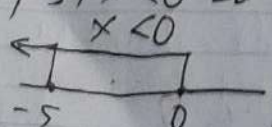
$\frac{5+x}{x}>0$.

•) $5+x>0 \Rightarrow x>-5$



$\Rightarrow (0, \infty)$

•) $5+x<0 \Rightarrow x<-5$



$\Rightarrow (-\infty, -5)$.

$\Rightarrow (-\infty, -5) \cup (-5, -\frac{5}{3}) \cup (0, \infty)$.

Problem Set 1.3

In problems 15-16, find the equation of the circle satisfying the given conditions.

15 Diameter AB, where $A = (1, 3)$ and $B = (3, 7)$

Ans:

$M = (2, 5)$.

$r(A, B) = \frac{\sqrt{4+16}}{2} \Rightarrow r(A, B) = \sqrt{5}$

$(x-h)^2 + (y-k)^2 = r^2$

$\Rightarrow (x-2)^2 + (y-5)^2 = 5$.

16 Center $(3, 4)$ and tangent to x-axis

Ans:

$(x-3)^2 + (y-4)^2 = 16$

In problems 17 - 22, find the center and radius of the circle with the given equation.

18 $x^2 + y^2 - 6y = 16$

Ans:

$x^2 + y^2 - 6y + 9 = 25$

$x^2 + (y-3)^2 = 25$

$M = (0, 3)$

$r = \sqrt{25} \Rightarrow r = 5$ & $M = (0, 3)$.

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20 $x^2 + y^2 - 10x + 10y = 0$

Ans:

$x^2 - 10x + 25 + y^2 + 10y + 25 = 50$

$(x-5)^2 + (y+5)^2 = 50$

$M = (5, -5)$

$r = \sqrt{50} \Rightarrow r = 5\sqrt{2}$

22 $x^2 + 16x + \frac{105}{16} + 4y^2 + 3y = 0$

Ans:

$x^2 + 16x + 64 + 4y^2 + 3y + \frac{9}{16} = \frac{-105}{16} + \frac{1024}{16} + \frac{9}{16}$

$(x+8)^2 + 4\left(y^2 + \frac{3}{4}y + \frac{9}{64}\right) = \frac{928}{16}$

$(x+8)^2 + 4\left(y + \frac{3}{8}\right)^2 = 58$

$M = \left(-8, -\frac{3}{8}\right)$

$r = \sqrt{58}$

In problems 23-28 find the slope of the line containing the given two points

24 $(3, 5)$ and $(4, 7)$

$m = 2$

26 $(2, -4)$ and $(0, -6)$

Ans: $m = \frac{-2}{-2} \Rightarrow m = 1$

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28 $(-6, 0)$ and $(0, 6)$

ans: $m = \frac{6}{6} \Rightarrow m = 1$

Find the equation for each line. Then write your answer in the form $Ax + By + C = 0$.

30 Through $(3, 4)$, with slope -1

Ans:

$(y - y_1) = m(x - x_1) \Rightarrow y - 4 = -x + 3$

$\Rightarrow x + y - 7 = 0$

32 with y-intercept 5, and slope 0

$\Rightarrow y = mx + c$

$\Rightarrow y = 5 \Rightarrow y - 5 = 0$

34 Through $(4, 1)$, and $(8, 2)$

Ans:

$m = \frac{1}{4}$.

$y - 1 = \frac{1}{4}(x - 4) \Rightarrow 4y - 4 = x - 4$

$\Rightarrow x - 4y = 0$

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Find the slope and y-intercept of each line.

36 $-4y = 5x - 6$

Ans:

$\Rightarrow y = \frac{-5}{4}x + \frac{3}{2}$

Obtained: $m = \frac{-5}{4}$; and $y = \frac{3}{2}$.

38 $4x + 5y = -20$

Ans:

$4x + 5y = -20 \Rightarrow y = \frac{-4}{5}x - 4$

Obtained: $m = \frac{-4}{5}$; and $y = -4$.

40 Find the value of c for which the line $3x + cy = 5$.

a) Passes through the point (3, 1)

Ans:

$\Rightarrow 9 + c = 5 \Rightarrow c = -4$.

Obtained $c = -4$

b) Is parallel to the y-axis

ans:

$3x + cy = 5 \Rightarrow y = \frac{-3}{c}x + \frac{5}{c}$.

Garis sejajar dgn sb-y, shg jika nilai $y = 0$, untuk itu diperoleh nilai $c = 0$.

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c) pasalle to the line $2x+3y=6$

Ans: $y = -\frac{2}{3}x + 2$

$m_1 = m_2 = -\frac{2}{3}$.

$y = -\frac{3}{C}x + \frac{5}{C}$

$\Rightarrow \frac{-3}{C} = \frac{-2}{3} \Rightarrow C = \frac{9}{2}$.

d) has equal x-and y-intercepts.

Ans: $3x + Cy = 5$

$\Rightarrow y = 0$

$\Rightarrow 3x = 5 \Rightarrow x = \frac{5}{3}$

$x = y = \frac{5}{3}$.

$\Rightarrow x = 0$

$\Rightarrow Cy = 5 \Rightarrow y = \frac{5}{C}$. $\frac{5}{3} = \frac{5}{C} \Rightarrow C = 3$.

Obtained $C = 3$.

e) is perpendicular to the line $y - 2 = 3(x+3)$

Ans: $3x + Cy = 5 \Rightarrow y = \frac{-3}{C}x + \frac{5}{C}$.

$y - 2 = 3(x+3)$

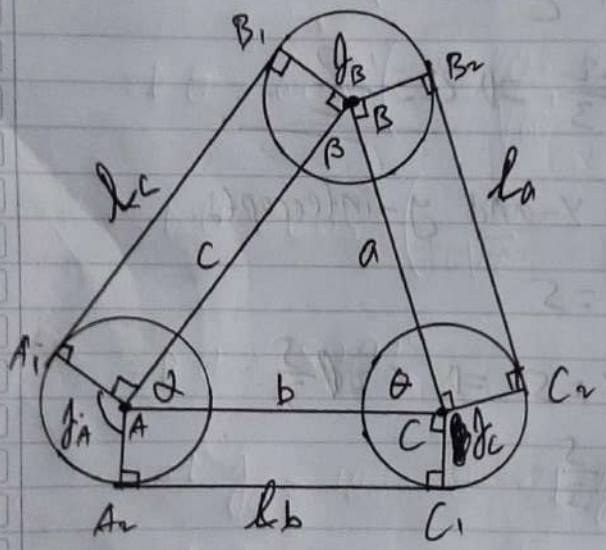
$\Rightarrow m_2 = 3$.

$\Rightarrow m_1 = \frac{-1}{m_2} \Rightarrow m_1 = -\frac{1}{3}$.

$\Rightarrow \frac{-3}{C} = \frac{-1}{3} \Rightarrow C = 9$

Obtained $C = 9$.

G1



A Belt fits around the three circles $x^2+y^2=4$, $(x-8)^2+y^2=4$, and $(x-6)^2+(y-8)^2=4$, as shown above. Find the length of this belt.

Ans: $l = l_a + l_b + l_c + \overset{\frown}{A_1A_2} + \overset{\frown}{B_1B_2} + \overset{\frown}{C_1C_2}$

$A(0,0)$; $B(6,8)$; $C(8,0)$

$l_a = a = \sqrt{64+4} \Rightarrow l_a = a = \sqrt{68} \approx 8,25$

$l_b = b = \sqrt{36+64} \Rightarrow l_b = b = 10$

$l_c = c = \sqrt{64} \Rightarrow l_c = c = 8$

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* $a^2 = b^2 + c^2 - 2bc \cdot \cos\alpha$

$2bc \cdot \cos\alpha = b^2 + c^2 - a^2$

$\Rightarrow \cos\alpha = \frac{b^2 + c^2 - a^2}{2bc} \Rightarrow \alpha = \cos^{-1}\left(\frac{(100+64-68)}{160}\right)$

$\Rightarrow \alpha = \cos^{-1}\left(\frac{96}{160}\right) \Rightarrow \alpha = 53,1°$

$\Rightarrow \gamma_A + 90 + \alpha + 90 = 360$

$\Rightarrow \gamma_A = 180 - 53,1 \Rightarrow \gamma_A = 126,9°$

$\Rightarrow \gamma_A = 126,9 \cdot \frac{\pi}{180}$ rad $\Rightarrow \gamma_A = 2,215$ rad.

•) $\overset{\frown}{A_1A_2} = r \cdot \gamma_A \Rightarrow \overset{\frown}{A_1A_2} = 4,43$ satuan

** $b^2 = a^2 + c^2 - 2ac \cdot \cos\beta$

$\cos\beta = \frac{68 + 64 - 100}{16 \cdot \sqrt{68}} \Rightarrow \beta = \cos^{-1}\left(\frac{32}{16\sqrt{68}}\right)$

$\Rightarrow \beta = 75,96° \Rightarrow$

~~$\beta = 75,96 \cdot \frac{\pi}{180}$ rad $\Rightarrow \beta = 1,336$ rad~~

$\gamma_B + 90 + \beta + 90 = 360 \Rightarrow \gamma_B = 180 - 75,96$

$\Rightarrow \gamma_B = 104,04 \Rightarrow \gamma_B \approx 104°$

$\Rightarrow \gamma_B = 104 \cdot \frac{\pi}{180}$ rad $\Rightarrow \gamma_B = 1,815$ rad

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• $\overset{\frown}{B_1B_2} = r \cdot \gamma_B \Rightarrow \overset{\frown}{B_1B_2} = 3{,}63$ satuan

*** $c^2 = a^2 + b^2 - 2ab \cdot \cos\theta$

$\Rightarrow \theta = \cos^{-1}\left(\frac{a^2+b^2-c^2}{2ab}\right)$

$\Rightarrow \theta = \cos^{-1}\left(\frac{68+100-64}{20\sqrt{68}}\right)$

$\Rightarrow \theta = \cos^{-1}\left(\frac{104}{20\sqrt{68}}\right)$

$\Rightarrow \theta = 50{,}91°$

$\Rightarrow \gamma_C = 180 - \theta \Rightarrow \gamma_C = 129{,}09°$

$\Rightarrow \gamma_C = 129{,}09 \cdot \frac{\pi}{180}$ rad $\Rightarrow \gamma_C = 2{,}253$ rad

• $\overset{\frown}{C_1C_2} = r \cdot \gamma_C \Rightarrow \overset{\frown}{C_1C_2} = 4{,}51$ satuan

$\Rightarrow l = l_a + l_b + l_c + \overset{\frown}{A_1A_2} + \overset{\frown}{B_1B_2} + \overset{\frown}{C_1C_2}$

$l = 8{,}25 + 10 + 8 + 4{,}43 + 3{,}63 + 4{,}51$

$l = 38{,}82$ satuan