

## Pangkat Rasional dan Bentuk Akar

### SOAL PENDAHULUAN

1. Nyatakanlah bentuk berikut ke dalam bentuk pangkat positif :

- |    |  |                                    |
|----|--|------------------------------------|
| a. | $\sqrt{3}$                                     | $3^{\frac{1}{2}}$                  |
| b. | $\sqrt{27}$                                    | $3^{\frac{3}{2}}$                  |
| c. | $\sqrt{\frac{1}{5}}$                           | $\frac{1}{5^{\frac{1}{2}}}$        |
| d. | $\sqrt[3]{25}$                                 | $5^{\frac{2}{3}}$                  |
| e. | $\sqrt[5]{64}$                                 | $2^{\frac{6}{5}}$                  |
| f. | $\sqrt[3]{\frac{1}{8}}$                        | $\frac{1}{2}$                      |
| g. | $\sqrt[3]{x^2 \cdot y^3}$                      | $x^{\frac{2}{3}} y$                |
| h. |  |                                    |
| i. | $\sqrt[3]{2 + y^2}$                            | $(x^2 + y^2)^{\frac{1}{2}}$        |
| j. | $\frac{\sqrt[3]{x^2 y^3}}{\sqrt{x \cdot y^3}}$ | $x^{\frac{1}{6}} y^{-\frac{1}{2}}$ |

2. Tentukanlah nilai dari :

- |    |   |               |
|----|---|---------------|
| a. | $32^{\frac{2}{5}}$                      | $2^2$         |
| b. | $25^{\frac{3}{2}}$                      | 125           |
| c. | $(5\sqrt{5})^{\frac{4}{3}}$             | 25            |
| d. | $(\frac{1}{8})^{\frac{-2}{3}}$          | 4             |
| e. | $(\frac{1}{2}\sqrt{2})^{-8}$            | 16            |
| f. | $125^{\frac{-4}{3}}$                    | 625           |
| g. | $(\frac{1}{49}\sqrt{7})^{\frac{-4}{3}}$ | 49            |
| h. | $(\frac{1}{27}\sqrt{3})^{\frac{1}{5}}$  | $\frac{1}{9}$ |

3. Sederhanakan bentuk berikut :

- |    |                                |                   |
|----|--------------------------------|-------------------|
| a. | $\sqrt[4]{x^3} \cdot \sqrt{x}$ | $x^{\frac{5}{4}}$ |
|----|--------------------------------|-------------------|

b.	$\left(\frac{\sqrt{x}}{\sqrt[3]{x}}\right)^6$	$x$
c.	$\frac{x^5 y^2 z^{-1}}{x^2 y^4 z^3}$	$x^3 y^{-2} z^{-4}$
d.	$\frac{\sqrt[3]{p^2 \cdot q}}{\sqrt{p} \cdot \sqrt[4]{q^3}}$	$p^{\frac{1}{6}} q^{\frac{-5}{12}}$
e.	$\sqrt{x^3} \sqrt[3]{x^2}$	$x^{\frac{11}{6}}$
f.	$\sqrt[3]{x^2} \cdot \sqrt{x} \cdot \sqrt[5]{2}$	

4. Tentukan Bentuk sederhana dari :

a.	$\sqrt[3]{\frac{a \cdot b}{c^5}} \cdot \sqrt[3]{\frac{a \cdot c}{b^5}} \cdot \sqrt[3]{\frac{b \cdot c}{a^5}}$	
b.	$\frac{1}{a+b+c} \cdot \left(\frac{1}{x-1}\right)^{-1} \cdot \left(\frac{1-x}{2-x}\right)^2 \cdot \left(\frac{x-2}{1-x}\right)^3$	$(2-x)$

5. Sederhanakan :

a.	$(3\sqrt{2}-\sqrt{6})^2$	$(24-6\sqrt{12})$
b.	$(7-2\sqrt{3})(7+2\sqrt{3})$	$37$
c.	$(3\sqrt{2}+\sqrt{3})(\sqrt{2}-2\sqrt{3})$	$-5\sqrt{6}$
d.	$(\sqrt{3}-\sqrt{5})^2(\sqrt{3}+\sqrt{5})^2$	$16$
e.	$(\sqrt{2}+\sqrt{3})(\sqrt{2}-\sqrt{3}+1)$	$-1+\sqrt{2}+\sqrt{3}$

6. Selesaikan

a.	$(\sqrt{3}+\sqrt{2}+\sqrt{6})^2$	$11+2\sqrt{6}+4\sqrt{3}+6\sqrt{2}$
b.	$(\sqrt{3}+\sqrt{2}+\sqrt{5})(\sqrt{3}+\sqrt{2}-\sqrt{5})$	$2\sqrt{6}$
c.	$(\sqrt{2}-\sqrt{3}+\sqrt{6})(\sqrt{2}+\sqrt{3}-\sqrt{6})$	$-7+6\sqrt{2}$
d.	$(\sqrt{6}+\sqrt{3}+\sqrt{2}+1)(\sqrt{6}-\sqrt{3}-\sqrt{2}+1)$	$2$

7. Rasionalkan

a.	$\sqrt{\frac{25}{18}}$	$\frac{5\sqrt{2}}{6}$
b.	$\sqrt{\frac{3}{2}} - \sqrt{\frac{2}{3}}$	$\frac{1}{6}\sqrt{6}$

8. Hitunglah

a.	$5\sqrt{3} + \frac{15}{\sqrt{3}} - 2\sqrt{75}$	$0$
b.	$3\sqrt{50} - 4\sqrt{32} + \sqrt{\frac{1}{2}}$	$\frac{-1}{2}\sqrt{2}$

9. Tentukan hasil dari perkalian berikut :

$$(\sqrt{6}+3)(\sqrt{6}-2)+\frac{4\sqrt{2}}{\sqrt{3}} \times 3 \qquad 5\sqrt{6}$$

10. Rasionalkan

$$\text{a. } \frac{\sqrt{6}}{\sqrt{2}+\sqrt{3}} \qquad 3\sqrt{2}-2\sqrt{3}$$

$$\text{b. } \frac{\sqrt{5}+2\sqrt{3}}{\sqrt{5}-\sqrt{3}} \qquad \frac{11}{2}+\frac{3}{2}\sqrt{15}$$

$$\text{c. } \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+2\sqrt{3}} \qquad \frac{-11}{7}+\frac{3}{7}\sqrt{15}$$

$$\text{d. } \frac{3\sqrt{2}+2\sqrt{3}}{2\sqrt{3}-3\sqrt{2}} \qquad -2\sqrt{6}-5$$

11. Rasionalkan bentuk berikut

$$\frac{1}{(\sqrt{3}+\sqrt{2})^2} \qquad 5-2\sqrt{6}$$

12. Sederhanakan bentuk berikut :

$$\frac{3\sqrt{2}}{\sqrt{6}-\sqrt{3}}-\frac{3}{3-\sqrt{6}} \qquad 3+3\sqrt{3}+2\sqrt{6}$$

13. Sederhanakan penjumlahan bentuk akar berikut :

$$\frac{3\sqrt{2}}{\sqrt{3}+\sqrt{6}}-\frac{4\sqrt{3}}{\sqrt{6}+\sqrt{2}}+\frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}} \qquad 2\sqrt{6}$$

14. Rasionalkan dan sederhanakan bentuk berikut :

$$\frac{1}{(2-\sqrt{3})^2}+\frac{1}{(2+\sqrt{3})^2} \qquad 14$$

15. Selesaikan bentuk akar di bawah ini :

$$\text{a. } \frac{1}{(\sqrt{3}-1)(\sqrt{5}+\sqrt{2})} \qquad \sqrt{15}-\sqrt{6}+\sqrt{5}-\sqrt{2}$$

$$\text{b. } \left(\frac{\sqrt{3}-\sqrt{5}}{2}\right)^2-3\left(\frac{3-\sqrt{5}}{2}\right)+1 \qquad \frac{-3-\sqrt{15}-3\sqrt{5}}{2}$$

$$\text{c. } \frac{2\sqrt{3}-4}{\sqrt{3}-1}+\frac{2\sqrt{2}-1}{\sqrt{2}-1}-\frac{1+\sqrt{6}}{\sqrt{2}+\sqrt{3}} \qquad 4-\sqrt{2}$$

16. Rasionalkan

$$\text{a. } \frac{1}{\sqrt{2}+\sqrt{3}+\sqrt{5}} \qquad 2\sqrt{15}-2\sqrt{6}+2\sqrt{5}-2\sqrt{2}$$

$$\text{b. } \frac{4}{1+\sqrt{2}+\sqrt{3}} \qquad 2+\sqrt{6}-4\sqrt{3}-5\sqrt{2}$$

17. Selesaikanlah bentuk akar berikut :

$$\text{a. } \sqrt{13-2\sqrt{22}} \qquad \sqrt{11}-\sqrt{2}$$

$$\text{b. } \sqrt{8+4\sqrt{3}} \qquad \sqrt{6}+\sqrt{2}$$

c.  $\sqrt{3-\sqrt{5}}$

$$\frac{1}{2}(\sqrt{10}-\sqrt{2})$$

d.  $\sqrt{6-3\sqrt{3}}$

$$\sqrt{\frac{9}{2}}-\sqrt{\frac{3}{2}}$$

e.  $\sqrt{9+3\sqrt{5}}$

$$\sqrt{\frac{15}{2}}+\sqrt{\frac{3}{2}}$$

f.  $\sqrt{14-3\sqrt{20}}$

$$\sqrt{9}-\sqrt{5}$$

18. Selesaikanlah juga bentuk berikut :

a.  $\sqrt{10\frac{1}{2}-2\sqrt{5}}$

$$\sqrt{10}-\sqrt{\frac{1}{2}}$$

b.  $\sqrt{6\frac{1}{3}-2\sqrt{2}}$

$$\sqrt{6}+\sqrt{\frac{1}{3}}$$

c.  $\sqrt{\frac{1}{5}+\frac{1}{25}\sqrt{21}}$

$$\sqrt{\frac{14}{100}}+\sqrt{\frac{6}{100}}$$

19. Tentukanlah nilai dari

a.  $\sqrt{2+\sqrt{3}} - \sqrt{2-\sqrt{3}}$

$$\sqrt{2}$$

b.  $\sqrt[4]{49-20\sqrt{6}}$

$$\sqrt{3}-\sqrt{2}$$

c.  $\left(1+\left(3+\sqrt{13+4\sqrt{3}}\right)^{\frac{1}{2}}\right)^{\frac{1}{2}}$

$$2+\sqrt{3}$$

20. Selesaikanlah bentuk berikut

a.  $\frac{(\sqrt{12}-\sqrt{18}+\sqrt{42})\sqrt{6}}{\sqrt{30-12\sqrt{6}+\sqrt{66}-6\sqrt{21}}}$

b.  $\sqrt{5\frac{1}{2}+\sqrt{13+4\sqrt{3}}}$

$$\sqrt{6}+\sqrt{\frac{1}{2}}$$

21.

22.

23.

24.

### SOAL LANJUTAN

1. Diketahui segitiga siku-siku, panjang sisi-sisi sikunya yaitu  $8-2\sqrt{5}$  dan  $8+2\sqrt{5}$ , maka keliling segitiga tersebut.....  
 $16+\sqrt{44}$
2. Pada sebuah segitiga siku-siku, panjang sisi siku-sikunya adalah  $(\sqrt{2}-\sqrt{5}-\sqrt{6})$  cm dan  $(\sqrt{2}\pm\sqrt{6})$  cm. Panjang sisi miringnya.....  $2\sqrt{5}-\sqrt{6}$
3. Sederhanakan

$$(a-b)\left(a^{\frac{1}{2}}+b^{\frac{1}{2}}\right)^{-1} \dots\dots\dots$$

$$\sqrt{a}-\sqrt{b}$$

4. Sederhanakan juga

$$(a\sqrt{2}-b\sqrt{5})(-a\sqrt{2}-b\sqrt{5}) \dots\dots\dots$$

$$5b^2-2a^2$$

5. Rasionalkan

$$\frac{\sqrt{2}+\sqrt{3}+1}{\sqrt{3}-\sqrt{2}-3} \dots\dots\dots$$

$$-2+\sqrt{6}-\sqrt{3}+2\sqrt{2}$$

6. Rasionalkan

$$\frac{\sqrt{2}-\sqrt{3}+\sqrt{5}}{\sqrt{2}+\sqrt{3}-\sqrt{5}} \dots\dots\dots$$

$$\frac{1}{3}\sqrt{6}+\frac{\sqrt{60}}{6}$$

7. Sederhanakan ke dalam bentuk pangkat positif

$$\frac{a^2 b^{-2} - a^{-2} b^2}{b^{-2} + a^{-2}} \dots\dots\dots (a^2 - b^2)$$

8. Sederhanakan

$$\frac{\sqrt{45} + \sqrt{27}}{\sqrt{8} + 2\sqrt{15}} + \frac{7 - 4\sqrt{3}}{7 + 4\sqrt{3}} + 168 \dots\dots\dots 100$$

9. Sederhanakan

$$a. \quad \frac{6}{2\sqrt{3}} - 9\sqrt{27} + 4\sqrt{\frac{1}{3}} + 3\sqrt{243} \dots\dots\dots \frac{7}{3}\sqrt{3}$$

$$\frac{2}{3}$$

$$\frac{2}{3}$$

$$b. \quad 4^{\frac{2}{3}} \dots\dots\dots 13$$

$$8^{\frac{2}{3}} + \frac{\sqrt[3]{2^2}}{\frac{2}{3}}$$

$$27^{\frac{2}{3}} + 16^{\frac{3}{4}} - \frac{2}{\frac{2}{3}}$$

10. Ditentukan  $p = (3 + 2\sqrt{2})^{-1}$  dan  $q = (3 - 2\sqrt{2})^{-1}$ , tentukanlah nilai

$$(1+p)^{-1} + (1+q)^{-1} \dots\dots\dots 1$$

11. Jika  $(\sqrt{3+2\sqrt{2}})^x - (\sqrt{3-2\sqrt{2}})^x = \frac{3}{2}$ , maka nilai x .....

$$(\sqrt{2}+1)^{\frac{1}{2}} \log 2$$

12. Jika  $x = 37 - 20\sqrt{3}$  dan  $y = 37 + 20\sqrt{3}$ , maka nilai  $x^{\frac{-1}{2}} + y^{\frac{-1}{2}}$

$$\dots\dots\dots \frac{10}{13}$$

13. Jika  $a = 2$ ,  $b = 6$  dan  $c = 3$ , maka tentukanlah nilai dari

$$\dots\dots\dots 4$$

$$\left\{ 2^{\frac{1}{2}} \sqrt{a^4 \cdot b \cdot c^{-1}} \right\}^{\frac{2}{3}}$$

14. Jika  $\frac{\sqrt{a} - \sqrt{b}}{\sqrt{a} + \sqrt{b}} + \frac{\sqrt{a} + \sqrt{b}}{\sqrt{a} - \sqrt{b}} = 3\frac{1}{3}$  dan nilai a positif, serta  $a - b \neq 0$ , maka a : b

15. Rasionalkan :

$$a. \quad \frac{10}{3\sqrt[3]{3} + \sqrt[3]{9} + 1}$$

$$\text{b. } \frac{6}{2^{\frac{4}{3}} + 2^{\frac{2}{3}} + 1}$$

16. Sederhanakan

$$\text{a. } \left[ 1 + \left( 3 + \sqrt{13 + 4\sqrt{3}} \right)^{\frac{1}{2}} \right]^{\frac{1}{2}}$$

$$\frac{2}{3}$$

$$\text{b. } \left[ a^{\frac{1}{2}} + \left\{ a^{\frac{-1}{3}} \left( a^{\frac{3}{4}} (\sqrt{a})^{\frac{-1}{2}} \right)^{\frac{1}{3}} \right\}^{-1} \right]^{\frac{1}{6}}$$

17. Rasionalkan

$$\text{a. } (2 - \sqrt{3})^{\frac{-1}{2}}$$

$$\text{b. } (3 - \sqrt{5})^{\frac{-1}{2}}$$

18. Jika  $x = \frac{\sqrt{7} + \sqrt{5}}{\sqrt{7} - \sqrt{5}}$ , maka tentukanlah nilai

$$\text{a. } x + \frac{1}{x}$$

$$\text{b. } x^2 + \frac{1}{x^2}$$

19. Hitunglah bentuk akar berikut

$$\text{a. } \frac{(3 - \sqrt{5})(\sqrt{3 + \sqrt{5}}) + (3 + \sqrt{5})(\sqrt{3 - \sqrt{5}})}{(11 + 6\sqrt{2})\sqrt{11 - 6\sqrt{2}} - (11 - 6\sqrt{2})\sqrt{11 + 6\sqrt{2}}}$$

$$\text{b. } \frac{\left(\frac{1}{2}\right)^{-1} \left(\frac{4}{49}\right)^{\frac{-1}{4}}}{\left(\frac{1}{2}\right)^{-1} \left(\frac{4}{49}\right)^{\frac{-1}{4}}}$$

$$\text{c. } (-1 + \sqrt{5})\sqrt{\frac{10 - 2\sqrt{5}}{10 + 2\sqrt{5}}} + (3 - \sqrt{5})\sqrt{\frac{10 + 2\sqrt{5}}{10 - 2\sqrt{5}}}$$

20. Sederhanakan

$$\left( \frac{5 + 2\sqrt{6}}{10 - \sqrt{49 + 20\sqrt{6}}} \right)^{\frac{-1}{4}} + \left( \frac{5 - 2\sqrt{6}}{10 - \sqrt{49 - 20\sqrt{6}}} \right)^{\frac{-1}{4}}$$

21. Sederhanakan bentuk eksponen berikut

$$\text{a. } \frac{\left(x^{\frac{3}{2}} + y^{\frac{-3}{2}}\right)\left(x^{\frac{3}{2}} - y^{\frac{-3}{2}}\right)}{x^2 + x y^{-1} + y^{-2}}$$

$$\text{b. } \left(x^{\frac{a}{a-b}}\right)^{\frac{1}{c-a}} \left(x^{\frac{b}{b-c}}\right)^{\frac{1}{a-b}} \left(x^{\frac{c}{c-a}}\right)^{\frac{1}{b-c}}$$

22. Selesaikan :

a.  $2\sqrt{\frac{2}{3}} + 4\sqrt{\frac{3}{8}} - 5\sqrt{\frac{1}{24}}$

b.  $2\sqrt{\frac{a}{b}} - 3\sqrt{\frac{b}{a}} + \frac{4}{\sqrt{ab}}$

23. Sederhanakan

a.  $\frac{1}{x - \sqrt{x^2 - y^2}} - \frac{1}{x + \sqrt{x^2 - y^2}}$

b.  $\sqrt{\frac{x - y}{x^3 y - 2x^2 y^2 + x y^3}}$

24. Hitunglah

$$\frac{\sqrt{\sqrt{3} + \sqrt{19 + 8\sqrt{3}}}}{\sqrt{(\sqrt{19 - 8\sqrt{3}}) - \sqrt{3}}} + i$$

25. Special Case

$$\frac{9 + \sqrt{10} + \sqrt{22} + \sqrt{55}}{\sqrt{2} + \sqrt{5} + \sqrt{11}}$$