Penyelesaian Lengkap

Praktis 4

Praktis Formatif

1 $\dfrac{27^{n+1}}{9^n \times 3^{2-n}}$

$= \dfrac{3^{3n+3}}{3^{2n} \times 3^{2-n}}$

$= \dfrac{3^{3n+3}}{3^{n+2}}$

$= 3^{2n+1}$

2 (a) $\dfrac{(6a^3b)^2}{3a^4b^{-2}}$

$= \dfrac{36a^6b^2}{3a^4b^{-2}}$

$= 12a^2b^4$

(b) $\left(2h^{-1}k^{\frac{1}{6}}\right)^3 \times \sqrt{25h^2k^5}$

$= 8h^{-3}k^{\frac{1}{2}} \times 5hk^{\frac{5}{2}}$

$= 40h^{-2}k^3$

3 (a) $3^{5-m} = \dfrac{3^5}{3^m}$

$= \dfrac{243}{y}$

(b) $8^{m+1} - 18^m = 8^m \times 8 - (2 \times 9)^m$

$= 8(2^{3m}) - 2^m \times (3^2)^m$

$= 8(2^m)^3 - 2^m \times (3^m)^2$

$= 8x^3 - xy^2$

4 $3^{n+2} - 5(3^n) + 3^{n-1}$

$= 3^n \times 3^2 - 5(3^n) + \dfrac{3^n}{3^1}$

$= 3^n\left[3^2 - 5 + \dfrac{1}{3}\right]$

$= 3^n\left[4\dfrac{1}{3}\right]$

$= 3^n\left(\dfrac{13}{3}\right)$

$= 13\left(\dfrac{3^n}{3}\right)$

$= 13(3^{n-1})$

13 ialah satu faktor, $\therefore$ ia boleh dibahagi tepat dengan 13.

13 *is a factor,* $\therefore$ *it is divisible by* 13.

5 (a) $2^{3-x} = \dfrac{1}{16}$

$= 2^{-4}$

$3 - x = -4$

$x = 7$

(b) $6^{2x-1} + 180 = 6^{2x}$

$\dfrac{6^{2x}}{6} + 180 = 6^{2x}$

Biar/*Let* $6^{2x} = ut$

$\dfrac{u}{6} + 180 = u$

$\dfrac{5}{6}u = 180$

$u = 216$

$6^{2x} = 216$

$6^{2x} = 6^3$

$2x = 3$

$x = \dfrac{3}{2}$

6 $3^x = 81^y$

$3^x = 3^{4y}$

$x = 4y \ldots ①$

$\dfrac{4^x}{32^y} = 8$

$\dfrac{2^{2x}}{2^{5y}} = 2^3$

$2^{2x-5y} = 2^3$

$2x - 5y = 3 \ldots ②$

Gantikan ② ke dalam ②,/*Substitute* ① *into* ②,

$2(4y) - 5y = 3$

$3y = 3$

$y = 1$

Apabila/*When* $y = 1$, $x = 4(1)$

$x = 4$

7 (a) $\sqrt{14} \times \sqrt{63}$

$= \sqrt{2 \times 7} \times \sqrt{7 \times 9}$

$= \sqrt{2 \times 7 \times 7 \times 9}$

$= \sqrt{2 \times 7^2 \times 3^2}$

$= 7 \times 3\sqrt{2}$

$= 21\sqrt{2}$

(b) $\dfrac{\sqrt{48}}{\sqrt{50}}$

$= \sqrt{\dfrac{48}{50}}$

$= \sqrt{\dfrac{24}{25}}$

$= \sqrt{\dfrac{4 \times 6}{25}}$

$= \dfrac{2}{5}\sqrt{6}$

8 (a) $\dfrac{5\sqrt{2} + 6}{\sqrt{2}}$

$= 5 + \dfrac{6}{\sqrt{2}} \times \dfrac{\sqrt{2}}{\sqrt{2}}$

$= 5 + \dfrac{6}{2}\sqrt{2}$

$= 5 + 3\sqrt{2}$

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(b) $\dfrac{\sqrt{12}}{\sqrt{5}-\sqrt{3}}$

$= \dfrac{2\sqrt{3}}{\sqrt{5}-\sqrt{3}} \times \dfrac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}}$

$= \dfrac{2\sqrt{3} \times (\sqrt{5}+\sqrt{3})}{5-3}$

$= \sqrt{15} + 3$

$= 3 + \sqrt{15}$

9 $(1 - 2\sqrt{5})^2 - \dfrac{4\sqrt{5}}{3+\sqrt{5}}$

$= (1 - 4\sqrt{5} + 4(5)) - \left(\dfrac{4\sqrt{5}}{3+\sqrt{5}} \times \dfrac{3-\sqrt{5}}{3-\sqrt{5}}\right)$

$= (21 - 4\sqrt{5}) - \left(\dfrac{4\sqrt{5}(3-\sqrt{5})}{9-5}\right)$

$= 21 - 4\sqrt{5} - 3\sqrt{5} + 5$

$= 26 - 7\sqrt{5}$

10 $\dfrac{(1-3\sqrt{7})^2}{3-\sqrt{7}}$

$= \dfrac{1 - 6\sqrt{7} + 9(7)}{3-\sqrt{7}}$

$= \dfrac{64 - 6\sqrt{7}}{3-\sqrt{7}} \times \dfrac{3+\sqrt{7}}{3+\sqrt{7}}$

$= \dfrac{192 + 46\sqrt{7} - 42}{9-7}$

$= \dfrac{150 + 46\sqrt{7}}{2}$

$= 75 + 23\sqrt{7}$

11 $2\sqrt{2}x - 4 = 3x - 5\sqrt{2}$

$2\sqrt{2}x - 3x = 4 - 5\sqrt{2}$

$x(2\sqrt{2} - 3) = 4 - 5\sqrt{2}$

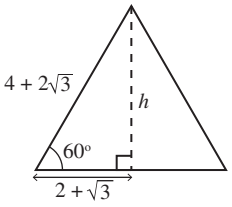
$x = \dfrac{4 - 5\sqrt{2}}{2\sqrt{2} - 3} \times \dfrac{2\sqrt{2}+3}{2\sqrt{2}+3}$

$x = \dfrac{8\sqrt{2} + 12 - 10(2) - 15\sqrt{2}}{4(2) - 9}$

$x = \dfrac{-8 - 7\sqrt{2}}{-1}$

$x = 8 + 7\sqrt{2}$

12 (a)



$\tan 60° = \dfrac{h}{2+\sqrt{3}}$

$\sqrt{3} = \dfrac{h}{2+\sqrt{3}}$

$h = 3 + 2\sqrt{3}$ cm

(b) Luas/*Area* $= \dfrac{1}{2} \times (4 + 2\sqrt{3}) \times (3 + 2\sqrt{3})$

$= (2 + \sqrt{3})(3 + 2\sqrt{3})$

$= 6 + 7\sqrt{3} + 2(3)$

$= 12 + 7\sqrt{3}$ cm^2

13 (a) $\log_3 5 = n$

$3^n = 5$

(b) $9^{n+1} = 9^n \times 9^1$

$= 3^{2n} \times 9$

$= (3^n)^2 \times 9$

$= (5)^2 \times 9$

$= 225$

14 (a) $\log_2 1.2 = \log_2 \dfrac{6}{5}$

$= \log_2 \dfrac{2 \times 3}{5}$

$= \log_2 2 + \log_2 3 - \log_2 5$

$= 1 + m - n$

(b) $\log_8 75 = \dfrac{\log_2 75}{\log_2 8}$

$= \dfrac{\log_2 (3 \times 25)}{3 \log_2 2}$

$= \dfrac{\log_2 3 + \log_2 5^2}{3}$

$= \dfrac{\log_2 3 + 2 \log_2 5}{3}$

$= \dfrac{m + 2n}{3}$

15 (a) $2 \log_4 y + 6 \log_4 x = 1$

$\log_4 y^2 + \log_4 x^6 = \log_4 4$

$\log_4 (y^2 x^6) = \log_4 4$

$y^2 x^6 = 4$

$yx^3 = 2$

$y = \dfrac{2}{x^3}$

(b) $\log_9 y = 2 - \log_3 x$

$\dfrac{\log_3 y}{\log_3 9} = 2 \log_3 3 - \log_3 x$

$\dfrac{\log_3 y}{2} = \log_3 9 - \log_3 x$

$\dfrac{1}{2}\log_3 y = \log_3 \dfrac{9}{x}$

$\log_3 \sqrt{y} = \log_3 \dfrac{9}{x}$

$\sqrt{y} = \dfrac{9}{x}$

$y = \dfrac{81}{x^2}$

16 (a) $5^{x+2} = 8$

$\lg 5^{x+2} = \lg 8$

$(x + 2)\lg 5 = \lg 8$

$x + 2 = \dfrac{\lg 8}{\lg 5}$

$x = -0.7080$

(b) $2^x \cdot 3^x = 7^{x+1}$

$(2 \times 3)^x = 7^x \times 7^1$

$\dfrac{6^x}{7^x} = 7$

$\lg\left(\dfrac{6}{7}\right)^x = \lg 7$

$x \lg \dfrac{6}{7} = \lg 7$

$x = -12.62$

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17 (a) $\log_x 6 + \log_x 3 = 2 - \log_x 2$

$\log_x 6 + \log_x 3 = 2\log_x x - \log_x 2$

$\log_x(6 \times 3) = \log_x x^2 - \log_x 2$

$\log_x 18 = \log_x\left(\frac{x^2}{2}\right)$

$18 = \frac{x^2}{2}$

$x^2 = 36$

$x = 6\ (x > 0)$

(b) $\log_2 y - \log_4 3y = 1$

$\log_2 y - \frac{\log_2 3y}{\log_2 4} = 1$

$\log_2 y - \frac{\log_2 3y}{2} = \log_2 2$

$\times 2,\ 2\log_2 y - \log_2 3y = 2\log_2 2$

$\log_2 \frac{y^2}{3y} = \log_2 4$

$\frac{y}{3} = 4$

$y = 12$

18 (a) $P = 25b^t$

Diberi/*Given* $t = 2$, $P = 27$,

$27 = 25b^2$

$b^2 = \frac{27}{25}$

$b^2 = \sqrt{\frac{27}{25}}$

$b = 1.04$

(b) $t = 8$, $P = 25(1.04)^8$

$= 34$ juta/*million*

(c) $25(1.04)^t > 40$

$(1.04)^t > 1.6$

$\lg(1.04)^t > \lg 1.6$

$t\lg(1.04) > \lg 1.6$

$t > 11.98$

$t = 12$

Tahun/*Year* 2022

19 (a) $N = N_o e^{-kt}$

$\frac{1}{4}N_o = N_o e^{-k(28)}$

$e^{-28k} = \frac{1}{4}$

$-28k = \ln\frac{1}{4}$

$k = 0.05$

(b) $\frac{1}{10}N_o = N_o e^{-0.05t}$

$e^{-0.05t} = \frac{1}{10}$

$-0.05t = \ln\frac{1}{10}$

$t = 46$ hari/*days*

Praktis Sumatif

Kertas 1

1 $\log_p 56 = \log_p (8 \times 7)$

$= \log_p 8 + \log_p 7$

$= 3\log_p 2 + \log_p 7$

$= \frac{3}{\log_2 p} + \frac{1}{\log_7 p}$

$= \frac{3}{x} + \frac{1}{y}$

2 $3e^{2x+5} = 4e^{6-x}$

$\frac{e^{2x+5}}{e^{6-x}} = \frac{4}{3}$

$e^{2x+5-(6-x)} = \frac{4}{3}$

$e^{3x-1} = \frac{4}{3}$

$3x - 1 = \ln\frac{4}{3}$

$x = \frac{1}{3}\left(1 + \ln\frac{4}{3}\right)$

$x = 0.429$

3 (a) Biar/*Let* $a^{\log_a x} = y$

Tulis dalam bentuk logaritma,

Write in logarithm form,

$\log_a y = \log_a x$

$y = x$

$\therefore a^{\log_a x} = x$

(b) $3^{1+2\log_3 x} = 12$

$3^{1+\log_3 x^2} = 12$

$3^1 \times 3^{\log_3 x^2} = 12$

$3x^2 = 12$

$x^2 = 4$

$x > 0,\ x = 2$

4 (a) $(a + 2\sqrt{5})^2 = 29 + b\sqrt{5}$

$a^2 + 4a\sqrt{5} + 20 = 29 + b\sqrt{5}$

Bandingkan integer/*Compare integer:*

$a^2 + 20 = 29$

$a^2 = 9$

$a = 3$

Bandingkan pekali bagi $\sqrt{5}$:

Compare the coefficient of $\sqrt{5}$*:*

$b = 4a$

$= 4(3)$

$= 12$

(b) $\frac{\log_{36} 16 \times \log_4 125}{\log_6 25}$

$= \frac{\frac{\log_2 16}{\log_2 36} \times \frac{\log_2 125}{\log_2 4}}{\frac{\log_2 25}{\log_2 6}}$

$= \frac{\log_2 16}{\log_2 36} \times \frac{\log_2 125}{\log_2 4} \times \frac{\log_2 6}{\log_2 25}$

$= \frac{\log_2 4^2}{\log_2 6^2} \times \frac{\log_2 5^3}{\log_2 4} \times \frac{\log_2 6}{\log_2 5^2}$

$= \frac{2\log_2 4}{2\log_2 6} \times \frac{3\log_2 5}{\log_2 4} \times \frac{\log_2 6}{2\log_2 5}$

$= \frac{3}{2}$

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5 (a) $\dfrac{7^{2n+1} - 5(49^n)}{343^n\,(7^{1-n})}$

$= \dfrac{7^{2n} \times 7 - 5(7^{2n})}{7^{3n}\,(7^{1-n})}$

$= \dfrac{7^{2n}\,(7-5)}{7^{3n+1-n}}$

$= \dfrac{7^{2n}\,(2)}{7^{2n} \times 7}$

$= \dfrac{2}{7}$

(b) $p + q\sqrt{2} = \left(\dfrac{3}{1-\sqrt{2}}\right)^2$

$= \dfrac{9}{1 - 2\sqrt{2} + 2}$

$= \dfrac{9}{3 - 2\sqrt{2}}$

$= \dfrac{9}{3 - 2\sqrt{2}} \times \dfrac{3 + 2\sqrt{2}}{3 + 2\sqrt{2}}$

$= \dfrac{27 + 18\sqrt{2}}{9 - 8}$

$= 27 + 18\sqrt{2}$

$p = 27,\ q = 18$

6 (a) $5^{x+1} + 5^{-x} = 6$

$5^x \times 5 + \dfrac{1}{5^x} = 6$

Biar/*Let* $5^x = u,$

$5u + \dfrac{1}{u} = 6$

$\times u,\ 5u^2 + 1 = 6u$

$5u^2 - 6u + 1 = 0$

$(5u - 1)(u - 1) = 0$

$u = \dfrac{1}{5}, \qquad u = 1$

$5^x = \dfrac{1}{5}, \qquad 5^x = 1$

$5^x = 5^{-1}, \qquad 5x = 5^0$

$x = -1, \qquad x = 0$

(b) $\log_3 x^3y = 3 - \log_3 x + \dfrac{2}{\log_y 3}$

$= 3\log_3 3 - \log_3 x + 2\log_3 y$

$= \log_3 27 - \log_3 x + \log_3 y^2$

$\log_3 x^3y = \log_3 + \dfrac{27y^2}{x}$

$x^3y = \dfrac{27y^2}{x}$

$y = \dfrac{x^4}{27}$

Kertas 2

1 (a) $k = \dfrac{\dfrac{2}{\sqrt{3}} - 1}{\dfrac{2}{\sqrt{3}} + 1} \times \dfrac{\sqrt{3}}{\sqrt{3}}$

$k = \dfrac{2 - \sqrt{3}}{2 + \sqrt{3}}$

$k = \dfrac{2 - \sqrt{3}}{2 + \sqrt{3}} \times \dfrac{2 - \sqrt{3}}{2 - \sqrt{3}}$

$k = \dfrac{(2 - \sqrt{3})^2}{4 - 3}$

$k = 4 - 4\sqrt{3} + 3$

$k = 7 - 4\sqrt{3}$

(b) $k - \dfrac{1}{k} = 7 - 4\sqrt{3} - \dfrac{1}{7 - 4\sqrt{3}}$

$= 7 - 4\sqrt{3} - \dfrac{1}{7 - 4\sqrt{3}} \times \dfrac{7 + 4\sqrt{3}}{7 + 4\sqrt{3}}$

$= 7 - 4\sqrt{3} - \dfrac{7 + 4\sqrt{3}}{49 - 16(3)}$

$= 7 - 4\sqrt{3} - (7 + 4\sqrt{3})$

$= -8\sqrt{3}$

2 (a) $2^{x+1} - 2^{x-1} = 2^x \cdot 2^1 - \dfrac{2^x}{2}$

$= 2^x\left(2 - \dfrac{1}{2}\right)$

$= 3\left(\dfrac{2^x}{2}\right)$

$= 3(2^{x-1})$

$k = 3$

(b) $3(2^{x-1}) = 6(2^{-x})^x$

$2^{x-1} = 2(2^{-x^2})$

$2^{x-1} = 2^{1-x^2}$

$x - 1 = 1 - x^2$

$x^2 + x - 2 = 0$

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

$x = 1,\ x = -2$

3 (a) $T = a(0.8)^t + b$

$t = 0,\ T = 100,$

$100 = a(0.8)^0 + b$

$a + b = 100 \ldots ①$

$t = 2,\ T = 73,$

$73 = a(0.8)^2 + b$

$0.64a + b = 73 \ldots ②$

① − ②, $0.36a = 27$

$a = 75$

Gantikan ke dalam ①,

Substitute into ①,

$75 + b = 100$

$b = 25$

(b) $T = 75(0.8)^t + 25$

$T < 30$

$75(0.8)^t + 25 < 30$

$75(0.8)^t < 5$

$(0.8)^t < \dfrac{1}{15}$

$\lg(0.8)^t < \lg\left(\dfrac{1}{15}\right)$

$t\lg(0.8) < \lg\left(\dfrac{1}{15}\right)$

$t > \dfrac{\lg\left(\dfrac{1}{15}\right)}{\lg(0.8)}$

$t > 12.14$

$t = 13$ minit/*minutes*

4 $a = 3^m \Rightarrow \log_3 a = m$

$b = 3^n \Rightarrow \log_3 b = n$

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(a) $\log_3 \frac{81a}{b^2} = \log_3 81 + \log_3 a - \log_3 b^2$
$= 4\log_3 3 + \log_3 a - 2\log_3 b$
$= 4 + m - 2n$

(b) $\log_{\sqrt{ab}} 27 = \frac{\log_3 27}{\log_3 \sqrt{ab}}$
$= \frac{3}{\frac{1}{2}\log_3 ab}$
$= \frac{6}{\log_3 a + \log_3 b}$
$= \frac{6}{m+n}$

5 (a) $AE = \sqrt{4^2 - 3^2} = \sqrt{7}$
$\frac{1}{2}(3 + EC + 3 + 2\sqrt{7})(\sqrt{7}) = 21 + 2\sqrt{7}$
$\frac{1}{2}(EC + 6 + 2\sqrt{7})(\sqrt{7}) = 21 + 2\sqrt{7}$
$EC + 6 + 2\sqrt{7} = \frac{2(21 + 2\sqrt{7})}{\sqrt{7}}$
$= \frac{42}{\sqrt{7}} + 4$
$= \frac{42}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} + 4$
$= \frac{42\sqrt{7}}{7} + 4$
$= 4 + 6\sqrt{7}$
$EC = -2 + 4\sqrt{7}$

(b) Biar BF = jarak serenjang dari B ke EC
Let BF = perpendicular distance from B to EC
$FC = -2 + 4\sqrt{7} - (3 + 2\sqrt{7})$
$FC = -5 + 2\sqrt{7}$
$BF = AE = \sqrt{7}$
$(BC)^2 = (FC)^2 + (AE)^2$
$(BC)^2 = (-5 + 2\sqrt{7})^2 + (\sqrt{7})^2$
$= 25 - 20\sqrt{7} + 4(7) + 7$
$= 60 - 20\sqrt{7}$

6 (a) (i) $(2 - \sqrt{3})^2 = 4 - 4\sqrt{3} + 3$
$= 7 - 4\sqrt{3}$

(ii) $\frac{4 - 2\sqrt{3}}{5 - 3\sqrt{3}} = \frac{4 - 2\sqrt{3}}{5 - 3\sqrt{3}} \times \frac{5 + 3\sqrt{3}}{5 + 3\sqrt{3}}$
$= \frac{20 + 2\sqrt{3} - 6(3)}{25 - 27}$
$= \frac{2 + 2\sqrt{3}}{-2}$
$= -1 - \sqrt{3}$

(b) $a(2 - \sqrt{3})^2 + b\left(\frac{4 - 2\sqrt{3}}{5 - 3\sqrt{3}}\right) = 9 - 13\sqrt{3}$
$a(7 - 4\sqrt{3}) + b(-1 - \sqrt{3}) = 9 - 13\sqrt{3}$
$7a - b + (-4a - b)\sqrt{3} = 9 - 13\sqrt{3}$
$7a - b = 9 \ldots ①$
$4a + b = 13 \ldots ②$
① + ②, $11a = 22$
$a = 2$
Gantikan ke dalam ②/*Substitute into* ②,
$4(2) + b = 13$
$b = 5$

7 (a) (i) $\sqrt{5^y} = \frac{5^x}{25}$
$5^{\frac{1}{2}y} = \frac{5^x}{5^2}$
$5^{\frac{1}{2}y} = 5^{x-2}$
$\frac{1}{2}y = x - 2$
$y = 2x - 4 \ldots ①$

(ii) $\log_2 y = 1 + 2\log_2 (x - 2)$
$\log_2 y = \log_2 2 + 2\log_2 (x - 2)$
$\log_2 y = \log_2 2 + \log_2 (x - 2)^2$
$\log_2 y = \log_2 2(x - 2)^2$
$y = 2(x - 2)^2$
$y = 2(x - 2)^2 \ldots ②$

(b) Gantikan ① ke dalam ②/*Substitute* ① *into* ②,
$2x - 4 = 2(x - 2)^2$
$x - 2 = x^2 - 4x + 4$
$x^2 - 5x + 6 = 0$
$(x - 2)(x - 3) = 0$
$x = 2, x = 3$
Gantikan ke dalam ①/*Substitute into* ①,
$x = 2, y = 2(2) - 4$
$y = 0$ (Tidak sah/*Invalid*)
$x = 3, y = 2(3) - 4$
$y = 2$

8 (a) $LHS = \log_{25} \frac{x^2}{y}$
$= \frac{\log_5 \frac{x^2}{y}}{\log_5 25}$
$= \frac{2\log_5 x - \log_5 y}{2\log_5 5}$
$= \frac{2\log_5 x}{2} - \frac{\log_5 y}{2}$
$= \log_5 x - \frac{1}{2}\log_5 y$
$= RHS$ (tertunjuk/*shown*)

(b) $\log_{25} \frac{x^2}{y} = 3$
$\log_5 x - \frac{1}{2}\log_5 y = 3 \ldots ①$
$\log_y x = 2$
$\frac{\log_5 x}{\log_5 y} = 2$
$\log_5 x = 2\log_5 y \ldots ②$
Gantikan ② ke dalam ①/*Substitute* ② *into* ①,
$2\log_5 y - \frac{1}{2}\log_5 y = 3$
$\frac{3}{2}\log_5 y = 3$
$\log_5 y = 2 \ldots ③$
$y = 5^2$
$y = 25$
Gantikan ③ ke dalam ②/*Substitute* ③ *into* ②,
$\log_5 x = 2(2)$
$\log_5 x = 4$
$x = 5^4$
$x = 625$

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