Diberi $\log_2 p = m$ dan $\log_2 \sqrt{q} = n$, ungkapkan $\log_2 \dfrac{p^5}{q}$ dalam sebutan m dan n.

Given that $\log_2 p = m$ and $\log_2 \sqrt{q} = n$, express $\log_2 \dfrac{p^5}{q}$ in terms of m and n.

$$. \quad \log_2 \sqrt{q} = n$$

$$\log_2 q^{\frac{1}{2}} = n$$

$$\frac{1}{2} \log_2 q = n$$

$$\log_2 q = 2n$$

$$\log_2 \frac{p^5}{q}$$

$$= \log_2 p^5 - \log_2 q$$

$$= 5 \log_2 p - \log_2 q$$

$$= 5m - 2n$$

Diberi bahawa $p = 3^x$ dan $q = 5^y$. Ungkapkan yang berikut dalam sebutan x dan y.

Given that $p = 3^x$ and $q = 5^y$. Express the following in terms of x and y.

$$\log_3 p - \log_5 q^2$$

[3 *markah* / 3 *marks*]

$p = 3^x$ dan $q = 5^y$

Maka,

$\log_3 p = \log_3 3^x$ dan $\log_5 q = \log_5 5^y$

$\log_3 p = x \log_3 3$ dan $\log_5 q = y \log_5 5$

$x = \log_3 p$ dan $y = \log_5 q$

Maka,

$\log_3 p - \log_5 q^2$

$= \log_3 p - 2 \log_5 q$

$= x - 2y$

Selesaikan persamaan yang diberi.
Solve the given equation.

$$3 + \log_2 (x - 1) = \log_2 x$$

[3 *markah* / 3 *marks*]

$$3 + \log_2(x - 1) = \log_2 x$$

$$\log_2(x - 1) - \log_2 x = -3$$

$$\log_2 \frac{x - 1}{x} = -3$$

$$\frac{x - 1}{x} = 2^{-3}$$

$$x - 1 = \frac{1}{8}x$$

$$x - \frac{1}{8}x = 1$$

$$\frac{7x}{8} = 1$$

$$x = 1 \times \frac{8}{7}$$

$$= 1\frac{1}{7}$$

Selesaikan persamaan berikut.
Solve the following equation.

$$\log_2 (p + 2) - 1 = \log_2 p$$

[3 markah / 3 marks]

$$\log_2 (p + 2) - 1 = \log_2 p$$

$$\log_2 (p + 2) - \log_2 p = 1$$

$$\log_2 \frac{p + 2}{p} = 1$$

$$\frac{p + 2}{p} = 2^1$$

$$p + 2 = 2p$$

$$2p - p = 2$$

$$p = 2$$

Diberi $y = x^{-3}$, cari

Given $y = x^{-3}$, find

(a) $\log_x y$

(b) $2 \log_y x$

[3 *markah / 3 marks*]

i. (a) $y = x^{-3}$

$$\log_x y = \log_x x^{-3}$$
$$= -3 \log_x x$$
$$= -3$$

(b) $2 \log_y x = \dfrac{2 \log_x x}{\log_x y}$

$$= 2\dfrac{1}{\log_x x^{-3}}$$

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

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

Atau

$$2 \log_y x = 2\left(\dfrac{1}{\log_x y}\right)$$

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

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

Selesaikan persamaan berikut.

Solve the following equation.

$$\log_m 324 - \log_{\sqrt{m}} m^2 = -6$$

[3 *markah / 3 marks*]

$$. \quad \log_m 324 - \log_{\sqrt{m}} m^2 = -6$$

$$\log_m 324 - \frac{\log_m m^2}{\log_m \sqrt{m}} = -6$$

$$\log_m 18^2 - \frac{2}{\left(\frac{1}{2}\right)} = -6$$

$$2 \log_m 18 = -6 + 4$$
$$2 \log_m 18 = -2$$
$$\log_m 18 = -1$$
$$18 = m^{-1}$$
$$\frac{1}{m} = 18$$
$$m = \frac{1}{18}$$

Diberi bahawa
Given that

$$P = \log_x Q$$

(a) Nyatakan syarat bagi x.
State the condition of x.

(b) Diberi
Given

$$\log_2 n = \frac{5}{\log_{mn} 2^3}$$

Ungkapkan n dalam sebutan m.
Express n in terms of m.

[3 markah / 3 marks]

(a) $P = \log_x Q$

$x > 0, x \neq 1$

(b) $\log_2 n = \dfrac{5}{\log_{mn} 2^3}$

$$\log_2 n = \dfrac{5}{\left(\dfrac{\log_2 2}{\log_2 mn}\right)}$$

$\log_2 n = 5 \, [\log_2 m + \log_2 n]$

$\log_2 n = 5 \log_2 m + 5 \log_2 n$

$-4 \log_2 n = 5 \log_2 m$

$\log_2 n^{-4} = \log_2 m^5$

$n^{-4} = m^5$

$\dfrac{1}{n^4} = m^5$

$n^4 = \dfrac{1}{m^5}$

$n = \left(\dfrac{1}{m^5}\right)^{\frac{1}{4}}$

$n = \dfrac{1}{m^{\frac{5}{4}}}$

$= m^{-\frac{5}{4}}$

Given that $x = 5^p$ and $y = 5^q$, express $\log_5 \dfrac{x^2}{y}$ in terms of p and q.

Diberi $x = 5^p$ dan $y = 5^q$, ungkapkan $\log_5 \dfrac{x^2}{y}$ dalam sebutan p dan q.

[5 marks/5 markah]

$$2p - q$$

Given that $\log_8 x^2 y + \log_8 \dfrac{\sqrt{y}}{x} = 1$, express y in terms of x.

Diberi $\log_8 x^2 y + \log_8 \dfrac{\sqrt{y}}{x} = 1$, *ungkapkan y dalam sebutan x.*

[5 *marks/5 markah*]

$$y = \sqrt[3]{\left(\frac{8}{x}\right)^2}$$

Solve the equation $\log_3 (2x + 1) - \log_3 (x - 7) = 2$.
Selesaikan persamaan $\log_3 (2x + 1) - \log_3 (x - 7) = 2$.

[5 marks/5 markah]

$$x = \frac{\quad}{\quad} = 9\frac{1}{7}$$

8) Given that $x = 3^p$ and $y = 3^q$, express $\log_9 x + \log_3 y$ in terms of p and q.

 Diberi $x = 3^p$ dan $y = 3^q$, ungkapkan $\log_9 x + \log_3 y$ dalam sebutan p dan q.

[5 marks/5 markah]

(b) $\dfrac{p + 2q}{2}$

Given that $\log_4 2 = p$ and $\log_4 5 = q$, express the following in terms of p and q.

Diberi $\log_4 2 = p$ *dan* $\log_4 5 = q$, *ungkapkan berikut dalam sebutan p dan q.*

(a) $\log_{25} 40$

(b) $\log_8 4\sqrt{125}$

[8 marks/8 markah]

(a) $\dfrac{3p + q}{2q}$

(b) $\dfrac{4p + 3q}{6p}$

Without using a calculator, solve the equation $\log_4 [\log_3 (5 - 4x)] = \log_{16} 4$.

Tanpa menggunakan kalkulator, selesaikan persamaan $\log_4 [\log_3 (5 - 4x)] = \log_{16} 4$.

<div align="right">[3 marks/3 markah]</div>

(a) $x = -1$

Solve the equation:
Selesaikan persamaan:
$$\frac{\log_3 (5x + 6)}{\log_9 (x + 2)} = 4$$

[4 *marks*/4 *markah*]

(a) $x = 1$ or/*atau* $x = 2$

(a) Simplify $\log_2 (x + 1) + 3 \log_2 x - 8 \log_4 x$ to a single logarithm.

Permudahkan $\log_2 (x + 1) + 3 \log_2 x - 8 \log_4 x$ *kepada logaritma tunggal.*

[4 *marks/4 markah*]

(b) Hence, solve the equation:

Seterusnya, selesaikan persamaan:

$$\log_2 (x + 1) + 3 \log_2 x - 8 \log_4 x = 2$$

[2 *marks/2 markah*]

(a) $\quad \log_2 \dfrac{x+1}{x}$

(b) $\quad x = \dfrac{1}{3}$

Selesaikan persamaan $\log_3 (2x+1) - \log_3 (x-7) = 2$.

Solve the equation $\log_3 (2x + 1) - \log_3 (x - 7) = 2$.

(b) $\log_3 (2x + 1) - \log_3 (x - 7) = 2$

$$\log_3 \frac{2x + 1}{x - 7} = 2$$

$$\frac{2x + 1}{x - 7} = 3^2$$

$$\frac{2x + 1}{x - 7} = 9$$

$$2x + 1 = 9x - 63$$

$$7x = 64$$

$$x = \frac{64}{7}$$

$$= 9\frac{1}{7}$$

Diberi $\log_8 x^2y + \log_8 \dfrac{\sqrt{y}}{x} = 1$, ungkapkan y dalam sebutan x.

Given that $\log_8 x^2y + \log_8 \dfrac{\sqrt{y}}{x} = 1$, express y in terms of x.

Diberi bahawa $x = 5^p$ dan $y = 5^q$, ungkapkan $\log_5 \dfrac{x^2}{y}$ dalam sebutan p dan q.

Given that $x = 5^p$ and $y = 5^q$, express $\log_5 \dfrac{x^2}{y}$ in terms of p and q.

(a) $\log_8 x^2 y + \log_8 \dfrac{\sqrt{y}}{x} = 1$

$$\log_8 (x^2 y)\left(\dfrac{\sqrt{y}}{x}\right) = 1$$

$$\log_8 xy^{\frac{3}{2}} = 1$$

$$xy^{\frac{3}{2}} = 8^1$$

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

$$y = \dfrac{4}{x^{\frac{2}{3}}}$$

(b) $\log_5 \dfrac{x^2}{y} = \log_5 x^2 - \log_5 y$

$$= \log_5 (5^p)^2 - \log_5 5^q$$
$$= 2p - q$$

Selesaikan persamaan/ *Solve the equation:*

$$\frac{\log_3 (5x + 6)}{\log_9 (x + 2)} = 4$$

(a) $\dfrac{\log_3 (5x + 6)}{\log_9 (x + 2)} = 4$

$$\dfrac{\log_3 (5x + 6)}{\dfrac{\log_3 (x + 2)}{\log_3 9}} = 4$$

$$\dfrac{\log_3 (5x + 6)}{\dfrac{\log_3 (x + 2)}{2}} = 4$$

$\log_3 (5x + 6) = 2 \log_3 (x + 2)$

$5x + 6 = (x + 2)^2$

$x^2 + 4x + 4 = 5x + 6$

$x^2 - x - 2 = 0$

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

$x = 2$

(a) Permudahkan / *Simplify* :

$$\log_2 (3x + 1) - 8 \log_{32} x^5 + 7 \log_2 x$$

(b) Seterusnya, selesaikan persamaan:

Hence, solve the equation:

$$\log_2 (3x + 1) - 8 \log_{32} x^5 + 7 \log_2 x = 3$$

(a) $\log_2 (3x + 1) - 8 \log_{32} x^5 + 7 \log_2 x$

$$= \log_2 (3x + 1) - 8\left(\frac{\log_2 x^5}{\log_2 32}\right) + \log_2 x^7$$

$$= \log_2 (3x + 1) - \frac{8}{5}\log_2 x^5 + \log_2 x^7$$

$$= \log_2 \frac{(3x + 1)(x^7)}{x^8}$$

$$= \log_2 \left(\frac{3x + 1}{x}\right)$$

(b) $\log_2 (3x + 1) - 8 \log_{32} x^5 + 7 \log_2 x = 3$

$$\log_2 \left(\frac{3x + 1}{x}\right) = 3$$

$$\frac{3x + 1}{x} = 2^3$$

$$3x + 1 = 8x$$

$$5x = 1$$

$$x = \frac{1}{5}$$

Diberi $\log_7 3 = h$ dan $\log_7 5 = k$, ungkapkan $\log_{\frac{1}{7}} 105$ dalam sebutan h dan k.

Given that $\log_7 3 = h$ and $\log_7 5 = k$, express $\log_{\frac{1}{7}} 105$ in terms h and k.

$$\log_{\frac{1}{7}} 105$$

$$= \frac{\log_7 105}{\log_7\left(\frac{1}{7}\right)} \qquad \longleftarrow \boxed{\log_a b = \frac{\log_c b}{\log_c a}}$$

$$= \frac{\log_7 (3 \times 5 \times 7)}{\log_7 7^{-1}}$$

$$= \frac{\log_7 3 + \log_7 5 + \log_7 7}{-\log_7 7} \qquad \longleftarrow \boxed{\begin{array}{l}\log_a xyz = \log_a x + \\ \log_a y + \log_a z\end{array}}$$

$$= \frac{h + k + 1}{-1} \qquad \boxed{\log_a x^n = n\log_a x}$$

$$= -h - k - 1$$

Given that $x = 2^r$ and $y = 2^t$, express $\log_{16}(x^2\sqrt{y})$ in terms of r and t.

Diberi $x = 2^r$ dan $y = 2^t$, ungkapkan $\log_{16}(x^2\sqrt{y})$ dalam sebutan r dan t.

Given that $x = 2^r$, then $\log_2 x = r$. $\longleftarrow$ | Changing from the index form to the logarithmic form.
Given that $y = 2^t$, then $\log_2 y = t$. $\longleftarrow$ |

$\log_{16}\left(x^2\sqrt{y}\right)$

$$= \frac{\log_2\left(x^2\sqrt{y}\right)}{\log_2 16} \longleftarrow \boxed{\log_a b = \frac{\log_c b}{\log_c a}}$$

$$= \frac{\log_2 x^2 + \log_2 y^{\frac{1}{2}}}{\log_2 2^4}$$

$$= \frac{2\log_2 x + \dfrac{1}{2}\log_2 y}{4\log_2 2} \qquad \ldots(*)$$

$$= \frac{2r + \dfrac{1}{2}t}{4}$$

$$= \frac{4r + t}{8}$$

Diberi $\log_a 3 = p$ dan $\log_a 5 = q$, ungkapkan $\log_{15} a$ dalam sebutan p dan q.

Given that $\log_a 3 = p$ and $\log_a 5 = q$, express $\log_{15} a$ in terms of p and q.

$$\log_{15} a = \frac{1}{\log_a 15}$$

$$= \frac{1}{\log_a (3 \times 5)}$$

$$\boxed{\log_a b = \frac{1}{\log_b a}}$$

$$= \frac{1}{\log_a 3 + \log_a 5}$$

$$= \frac{1}{p + q}$$

Solve the equation $\log_2 y = 3 + \log_2 (y - 7)$.

Selesaikan persamaan $\log_2 y = 3 + \log_2 (y - 7)$.

Solve the equation $\log_2 y = 3 + \log_2 (y - 7)$.

Selesaikan persamaan $\log_2 y = 3 + \log_2 (y - 7)$.

$$\log_2 y = 3 + \log_2 (y - 7)$$

$$\log_2 y - \log_2 (y - 7) = 3$$

$$\log_2 \left(\frac{y}{y-7}\right) = 3 \longleftarrow \boxed{\log_a m - \log_a n = \log_a \left(\frac{m}{n}\right)}$$

$$\frac{y}{y-7} = 2^3 \longleftarrow \boxed{\log_a m = n \Rightarrow m = a^n}$$

$$y = 8y - 56$$

$$7y = 56$$

$$y = 8$$

Selesaikan persamaan $\log_5 x + \log_5 (2x - 3) = 1$.

Solve the equation $\log_5 x + \log_5 (2x - 3) = 1$.

$$\log_5 x + \log_5 (2x - 3) = 1$$
$$\log_5 x(2x - 3) = 1 \longleftarrow$$

$$\boxed{\log_a m + \log_a n = \log_a (mn)}$$

$$x(2x - 3) = 5^1 \longleftarrow$$

$$\boxed{\log_a m = n \Rightarrow m = a^n}$$

$$2x^2 - 3x - 5 = 0$$
$$(2x - 5)(x + 1) = 0$$
$$x = \frac{5}{2} \text{ or } -1$$
$$x = -1 \text{ is not accepted.}$$
$$\therefore x = \frac{5}{2}$$

$x = -1$ is not accepted because logarithm of a negative number is undefined.

Solve the equation $\log_3 x = \log_9 (x + 6)$.

Selesaikan persamaan $\log_3 x = \log_9 (x + 6)$.

$$\log_3 x = \log_9 (x + 6)$$

$$\log_3 x = \frac{\log_3 (x + 6)}{\log_3 9}$$

Make the base to be the same.

$$\log_a b = \frac{\log_c b}{\log_c a}$$

$$\log_3 x = \frac{\log_3 (x + 6)}{2}$$

$$\log_3 9 = \log_3 3^2 = 2$$

$$2\log_3 x = \log_3 (x + 6)$$
$$\log_3 x^2 = \log_3 (x + 6)$$

$$n\log_a x = \log_a x^n$$

$$\therefore x^2 = x + 6$$
$$x^2 - x - 6 = 0$$
$$(x + 2)(x - 3) = 0$$
$$x = -2 \text{ or } 3$$
$$x = -2 \text{ is not accepted.}$$
$$\therefore x = 3$$

$x = -2$ is not accepted because logarithm of a negative number is undefined.

Diberi $x = 3^r$ dan $y = 3^t$, ungkapkan setiap yang berikut dalam sebutan r dan t.

(a) $\log_3 \left(\dfrac{xy^3}{27} \right)$

(b) $\log_9 \left(\dfrac{x^3}{7} \right)$

Given that $x = 3^r$ and $y = 3^t$, express each of r and t.

(a) $\log_3 \left(\dfrac{xy^3}{27} \right)$

(b) $\log_9 \left(\dfrac{x^3}{7} \right)$

(a) $r + 2t - 3$

(b) $\dfrac{3r - t}{2}$