



MODUL TOPIKAL
SOALAN PERCUBAAN SPM 2023

TOPIK TINGKATAN 4
BAB 4

INDEKS, SURD DAN LOGARITMA
(*INDICES, SURDS AND LOGARITHMS*)

SUMBER SOALAN:
SOALAN – SOALAN PERCUBAAN

TERENGGANU
NEGERI SEMBILAN
KELANTAN
SABAH
SBP
MELAKA
SELANGOR (MODUL PINTAS-SET 1)
PERAK

SKEMA JAWAPAN

DISUSUN OLEH:
PN. NOORUL HUDA BINTI MOHD HASHIM
(SMK TAMAN TASIK, TAIPING)

PN ZAINAB BINTI ABD RAHMAN
(SMK CONVENT, TAIPING)

SOALAN 1 : SOALAN PERCUBAAN SPM NEGERI TERENGGANU 2023 (KERTAS 1)

4	(a) Guna : $\log_a b = \frac{\log_c a}{\log_c b}$	K1	4
	$b = \frac{a^2}{81}$	N1	
	(b) Guna : $a^m \times a^n = a^{m+n}$ ATAU $a^m \div a^n = a^{m-n}$	K1	
	3^{m-1}	N1	

SOALAN 2 : SOALAN PERCUBAAN SPM NEGERI TERENGGANU 2023 (KERTAS 2)

3	(a) Pendaraban dengan surd konjugat & selesaikan		6
	$\frac{7}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}}$ dan $\frac{21+7\sqrt{2}}{9-2}$	K1	
	$(\sqrt{a+b\sqrt{2}})^2 = (3+\sqrt{2})^2$	K1	
	$a = 11$	N1	
	$b = 6$	N1	
	(b) $e^{\ln(11)^2} + e^{\ln(6)^2}$ & Selesaikan @ $*(11)^2 + *(6)^2$	K1	
	157	N1	

SOALAN 3 : SOALAN PERCUBAAN SPM NEGERI SEMBILAN 2023 (KERTAS 2)

	MARK
3 (a) $\log_2 \left(\frac{y^2}{x} \right) = 4$	K1
$\frac{y^2}{x} = 2^4$	K1
$y = 4\sqrt{x}$	N1

SOALAN 4 : SOALAN PERCUBAAN SPM NEGERI KELANTAN 2023 (KERTAS 1)

5	$27^{y+1} + 27^y$ atau $3^{3y+3} + 3^{3y}$ atau $(27+1)27^y$	K1	5
(a)	$a = 28$ dan $b = 27$	N1	
5	$\frac{\log_p(3-x)}{\log_p \sqrt{p}}$	P1	
(b)	$5 + x^2 = (3-x)^2$ $x = \frac{2}{3}$	K1 N1	

SOALAN 5 : SOALAN PERCUBAAN SPM NEGERI KELANTAN 2023 (KERTAS 1)

6	$1000x - x = 168$	K1	5
(a)	$x = \frac{56}{333}$	N1	
6	$\frac{\sqrt{6}}{\sqrt{12}-\sqrt{5}} \times \frac{\sqrt{12}+\sqrt{5}}{\sqrt{12}+\sqrt{5}}$	K1	
(b)	$\frac{\sqrt{6 \times 12} + \sqrt{6 \times 5}}{\sqrt{12^2} - \sqrt{12 \times 5} + \sqrt{12 \times 5} - \sqrt{5^2}}$ $p = 6$ dan $q = 30$	K1 N1	

SOALAN 6 : SOALAN PERCUBAAN SPM NEGERI SABAH 2023 (KERTAS 1)

2	a) $-\log_m abc$	N1	4
	b) $49m^5 n^c = \frac{2401}{a} m^{10+b-7} n^{4+2-1}$	K1	
	$49 = \frac{2401}{a}$ or $5 = 3 + b$ or $c = 4 + 2 - 1$	K1	
	$a = 49, b = 2$ and $c = 5$	N1	

SOALAN 7 : SOALAN PERCUBAAN SPM NEGERI SABAH 2023 (KERTAS 1)

3	a) $3x+2 = \log_e 10$ OR $3x+2 = \ln 10$ $x = 0.1009$	K1 N1	6
	b) $\frac{\log_3(2+x)}{\log_3 9}$ (Change base) $(6+5x) = (2+x)^2$ $(x+1)(x-2) = 0$ $x = -1, x = 2$	K1 K1 K1 N1	

SOALAN 8 : SOALAN PERCUBAAN SPM NEGERI SABAH 2023 (KERTAS 1)

11	$(23 - 3\sqrt{5})\pi = \pi(3 + \sqrt{20})^2 h$	P1	5
	Nampak mana-mana satu pengembangan surd: $-3 \times \sqrt{20}$ atau $-3 \times 2\sqrt{5}$ atau $-6 \times \sqrt{4 \times 5}$ atau $-6 \times 2\sqrt{5}$ atau $6\sqrt{20}$ atau $12\sqrt{5}$ atau $-138 \times \sqrt{4 \times 5}$ atau $-138 \times 2\sqrt{5}$ atau $-138 \times 2\sqrt{5}$ atau $276 \times \sqrt{5}$ atau $363\sqrt{5}$ atau $-138\sqrt{20}$ atau setara	K1	
	$\frac{23-3\sqrt{5}}{29+6\sqrt{20}} \times \frac{29-6\sqrt{20}}{29-6\sqrt{20}}$ or $\frac{23-3\sqrt{5}}{29+12\sqrt{5}} \times \frac{29-12\sqrt{5}}{29-12\sqrt{5}}$	K1	
	$\frac{667-138\sqrt{20}-87\sqrt{5}+18\sqrt{100}}{841-36(20)}$ or $\frac{667-276\sqrt{5}-87\sqrt{5}+180}{841-144(5)}$	K1	
$h = 7 - 3\sqrt{5}$	N1		

SOALAN 9 : SOALAN PERCUBAAN SPM SBP 2023 (KERTAS 1)

13(a) Menukar asas

$$(3^{-2})^{y-1}, 3^4 @ 2^{3x}, 2^6 \text{ dilihat } \mathbf{K1}$$

4

Guna hukum indeks

$$3^{4x-2y+2} = 3^4 @ 2^{3x-y} = 2^6 \quad \mathbf{K1}$$

Menyelesaikan *persamaan serentak $\mathbf{K1}$

$$x = 5, y = 9 \quad \mathbf{N1}$$

(b) $\tan \angle BAC = \frac{3+2\sqrt{5}}{2+3\sqrt{5}} \quad \mathbf{P1}$

4

$$* \left(\frac{3+2\sqrt{5}}{2+3\sqrt{5}} \right) \times \frac{2-3\sqrt{5}}{2-3\sqrt{5}} @ \text{ setara } \mathbf{K1}$$

$$\frac{6-9\sqrt{5}+4\sqrt{5}-30}{4-45} @ \frac{6-9\sqrt{5}+4\sqrt{5}-30}{4-45} @ \text{ setara } \mathbf{K1}$$

8

SOALAN 10 : SOALAN PERCUBAAN SPM SBP 2023 (KERTAS 2)

(b)(i)	<p><u>Tukar asas</u> $\frac{\log x^2}{\log 9}$ K1</p>	5	
	<p><u>Guna hukum kuasa</u> $\frac{2 \log x}{2}$ K1</p>		
	<p>$\log_3 \frac{(3x-1)}{x}$ N1</p>		
(b)(ii)	<p><u>Menyelesaikan persamaan</u> $* \left(\frac{3x-1}{x} \right) = \frac{1}{3}$ K1</p> <p>$\frac{3}{8}$ N1</p>		

SOALAN 11 : SOALAN PERCUBAAN SPM NEGERI MELAKA 2023 (KERTAS 1)

5 (a)	<p>$4^{4x+3} = 4^x$ dan $4x + 3 = x$</p> <p>atau</p> <p>$2^{4(2x)+6} = 2^{2x}$ dan $4(2x) + 6 = 2x$</p> <p>$x = -1$</p>	1	
(b)	<p>$\frac{\log_3 k}{\log_3 9}$</p> <p>$\log_3 p^2 k = 6$</p> <p>$p^2 k = 729$ atau setara</p>	1 1 1	
			5

SOALAN 12 : SOALAN PERCUBAAN SPM NEGERI MELAKA 2023 (KERTAS 1)

10. (a)	$42 + 6\sqrt{h} + 28\sqrt{h} + 4h$	1	
	$42 + 34\sqrt{h} + 4h$	1	
(b)	$\frac{1}{2}[(8 - 2\sqrt{h}) + (6 + 4\sqrt{h})][\frac{1}{2}(6 + 4\sqrt{h})] = 27 + 17\sqrt{h}$	1	5
	$21 + 2h = 27$	1	
	$h = 3$	1	

SOALAN 13 : SOALAN PERCUBAAN SPM NEGERI SELANGOR SET 1 2023 (KERTAS 1)

3	(a)	Tukar 6^{k+2} kepada $6^k(6^2)$ atau 6^{k+1} kepada $6^k(6^1)$ $6^k(6^2 + 6 - 18)$ $6^k(24)$	K1 K1 N1	
	(b)	<p>Alternatif 1:</p> <p>Gunakan mana-mana hukum log dengan betul</p> $\frac{\log_5 t}{\log_5 25} @ \log_{25} s^2 - \log_{25} t - \log_{25} 5 @ \log_5 s @$ $\log_5 t @ \frac{\log_5 5}{\log_5 25} @ \frac{\log_5 s^2}{\log_5 25}$ <p>Tukar asas</p> $-\frac{\log_5 5}{\log_5 25} + \frac{2 \log_5 s}{\log_5 25} - \frac{\log_5 t}{\log_5 25}$ $-\frac{1}{2} + a - \frac{b}{2} \text{ atau } \frac{2a-1-b}{2}$ <p>Alternatif 2:</p> <p>Tukar kepada bentuk log</p> $a = \log_5 s, b = \log_5 t$ $\log_{25} \frac{s^2}{5t}$ $2 \log_{25} s - \log_{25} 5t$ $2 \left(\frac{\log_5 s}{\log_5 5^2} \right) - \frac{\log_5 5 + \log_5 t}{\log_5 5^2}$ $\frac{2a - 1 - b}{2}$	K1 K1 N1 K1 N1	
				6

SOALAN 14 : SOALAN PERCUBAAN SPM NEGERI SELANGOR SET 1 2023 (KERTAS 1)

15	(a)		$4\sqrt{3} - 2(3) + 4 - 2\sqrt{3}$ $2\sqrt{3} - 2$	K1 N1	
	(b)	(i)	30	P1	
		(ii)	$30\left(\frac{4}{5}\right)^t = 15.36$ $t \log_{10}\left(\frac{4}{5}\right) = \log_{10}\left(\frac{15.36}{30}\right)$ $t = \frac{\log\frac{15.36}{30}}{\log\frac{4}{5}}$ $t = 3$	K1 N1	
		(iii)	$30\left(\frac{4}{5}\right)^t < 5$ $t \log_{10} 0.8 < \log_{10} \frac{1}{6}$ $t > 8.0296$ $t = 9$	K1 K1 N1	
					8

SOALAN 15 : SOALAN PERCUBAAN SPM NEGERI SELANGOR SET 1 2023 (KERTAS 2)

3	(a)		$\frac{64x^8y^6}{16x^5y}$ $4x^3y^5$	K1 N1	
	(b)		$2^{4x-1} = 2^4$ $4x - 1 = 4$ $x = \frac{5}{4}$	K1 K1 N1	
					5

SOALAN 16 : SOALAN PERCUBAAN SPM NEGERI PERAK 2023 (KERTAS 1)

8	(a)	$p = \log_a x$ $x^n = (a^p)^n$ $\log_a x^n = \log_a (a^{np})$ $\log_a x^n = np$ $\log_a x^n = n(\log_a x)$	 1 1 1	7
	(b)	$\log_e e^{-1.4x} = \frac{1}{2} \log_e 10$ $\ln e^{-1.4x} = \ln\left(\frac{1}{2}\right)$ $-1.4x = \ln\left(\frac{1}{2}\right)$ $x = 0.4951$	1 1 1 1	

SOALAN 17 : SOALAN PERCUBAAN SPM NEGERI PERAK 2023 (KERTAS 2)

5	(a)	i	$m^{xy+2x-xy+yz-xz-yz}$ m^{2x-xz}	1 1	8
		ii	$3^n(3^2 - 1 + \frac{10}{3}) = k(3^n)$ $11\frac{1}{3} / \frac{34}{3}$	1 1	
	(b)	i	$h = \frac{2(10+8\sqrt{2})}{4+3\sqrt{2}} \times \frac{4-3\sqrt{2}}{4-3\sqrt{2}}$ $= 8 - 2\sqrt{2}$	1 1	
		ii	$\sqrt{(8-2\sqrt{2})^2 + (4+3\sqrt{2})^2}$ 9.73 cm	1 1	