Year 10 Math Methods



2023 Semester 1

Indices, Surds, Logarithms & Algebra Skills CAT

Stud	ent	Name:			

Writing time: 40 minutes

Total marks: 35

Materials allowed: General Stationary (pens, pencils, rulers etc)

Instructions:

- For questions worth more than one-mark, full working out must be shown.
- Unless otherwise stated, exact answers must be used

PART A: Multiple Choice

- Place your answer into the table at the end of this section
- No working needs to be shown.
- Each correct answer is worth 1 mark

	Questions	Working Space if Required
1	The number $0.\overline{159261}$ is:	
	A A natural number	
	B An integer	
	C A rational number	
	D An irrational number	
	E An imaginary number	
2	When simplified $\frac{12xy^6}{9x^2} \times \frac{3(x^5y^2)^0}{y^4}$ becomes:	
	A $6xy^2$	
	$B = \frac{4y^2}{x}$	
	$C = \frac{4y^2}{3x}$	
	D $4xy^2$	
	$E \frac{2y^2}{3x^2}$	
3	When simplified, $\left(\frac{4a^{-2}}{5b^{-1}}\right)^{-3}$ becomes:	
	$A = \frac{4a^6}{5b^3}$	
	B $\frac{125a^6}{64b^3}$	
	$C = \frac{64b^3}{125a^6}$	
	D $\frac{64a^6}{125b^3}$	
	$E \frac{4a^6}{5b^3}$	

4 When fully simplified, $\sqrt{96} + 5\sqrt{24}$ is equal to: A $7\sqrt{24}$ B $6\sqrt{3} + 10\sqrt{6}$ C $9\sqrt{6}$ D $9\sqrt{24}$ E $14\sqrt{6}$ 5 $\frac{5}{2+\sqrt{3}}$ when expressed with a rational denominator is equal to: A $10 + 5\sqrt{3}$ B $\frac{10+5\sqrt{3}}{7}$ C $10 - \sqrt{3}$ D $10 - 5\sqrt{3}$ E $\sqrt{3}$ 6 $3\log_{10}(a) + \log_{10}(b) - \log_{10}(c)$ is equivalent to: A $\log_{10}\left(\frac{a^3b}{c}\right)$ B $3\log(a + b - c)$ C $3\log_{10}\left(\frac{a^3b}{c}\right)$ D $\log_{10}\left(\frac{a^3b}{c}\right)$ 7 The expression $\frac{2x+3}{4} - \frac{x-1}{2}$ simplifies to: A $\frac{x-2}{2}$ B $\frac{x+5}{4}$ C $\frac{5}{4}$ D $\frac{x+4}{4}$	_	
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A $\frac{x-2}{2}$ B $\frac{x+5}{4}$ C $\frac{5}{4}$	7	The expression $\frac{2x+3}{4} - \frac{x-1}{2}$ simplifies to:
$C = \frac{5}{4}$		
		B
		$C = \frac{5}{4}$
		D $\frac{x+4}{4}$
$E = \frac{1}{4}$		

8	Evaluate the expression $(3abc^3)^3$, when
	a=-1,b=2, and $c=1$
	A 54
	B 216
	C 81
	D -200
	E -216
9	Solve for x: $\frac{x}{5} - \frac{1}{7} = \frac{1}{35}$
	A x = 4
	$B x = \frac{4}{7}$
	C x = 6
	$D x = \frac{6}{7}$
	$E x = -\frac{4}{7}$
10	Solve for y:
	$\log_{10}(x-2) - 3\log_{10}(x) = -\log_{10}y$
	$A = \frac{x^3}{x-2}$
	$B = \frac{x-2}{x^3}$
	$C - \frac{x-2}{x^3}$
	D $2x + 2$
	$E \frac{1}{2x+2}$

Q1	Q2	Q3	Q4	Q5
Q6	Q7	Q8	Q9	Q10
			-	

PART B: Short Answer

• You must show full working for any questions worth more than one mark

Question 1

a) Simplify and write in index form:

$$(\sqrt{4x})^3$$

b) Simplify and write in surd form:

$$(16a^2)^{\frac{1}{4}}$$

(1+1 = 2 marks)

Question 2

Simplify the following:

a)
$$(m^6n^3)^{\frac{1}{3}} \div (m^{-\frac{1}{2}}n^3)^2$$

c)
$$\frac{x+2}{2} + \frac{x-6}{3}$$

b)
$$2\sqrt{6} \times 4\sqrt{3}$$

d)
$$\frac{2}{x+3} \times \frac{x+7}{8} \div \frac{12(x+7)}{x+3}$$

Question 3

Solve for x:

a)
$$\frac{3x}{5} + 6 = 0$$

b)
$$2(4x + 12) = 5(3x - 5)$$

(2+3 = 5 marks)

Question 4

a) Transpose the formula $a=\sqrt{\frac{3V}{h}}$ to make V the subject

b) Hence or otherwise, find the value of V when a=3 and h=4.

(2+2 = 4 marks)

Question 5

a) Find the positive value of x, if $\log_x 64 = 2$

b) Solve for x: $\log_2(4x - 2) = \log_2(2x - 1) + x$

(2+3 = 5 marks)

END OF TEST

Formula Sheet

Index Laws:

- 1) $a^m x a^n = a^{m+n}$
- $2) \quad a^m \div a^n = a^{m-n}$
- 3) $a^0 = 1$
- 4) $(a^m)^n = a^{mn}$
- 5) $(ab)^m = a^m x b^m$
- $6) \ \left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$
- $7) \quad a^{-m} = \frac{1}{a^m}$
- 8) $a^{\frac{1}{m}} = \sqrt[m]{a}$

Logarithm Laws:

- 1) $\log_a(xy) = \log_a(x) + \log_a(y)$
- 2) $\log_a\left(\frac{x}{y}\right) = \log_a(x) \log_a(y)$
- $3) \log_a(x^n) = n \log_a(x)$
- $4) \log_a(1) = 0$
- $5) \log_a(a) = 1$
- 6) $\log_a\left(\frac{1}{x}\right) = -\log_a(x)$
- $7) \ \log_a(a^x) = x$