



**SKILLS & APPLICATIONS TASK – TRIAL TEST A**

*Exponentials & Logarithms*

**STUDENT DETAILS:**

**NAME:** .....

**HOME GROUP:** .....

**Assessment Conditions:**

written (supervised)      60 min      Only formula sheet given (NO NOTES)

**Assessment Criteria:**

Concepts and Techniques

- CT1 Knowledge and understanding of concepts and relationships.
- CT2 Selection and application of mathematical techniques and algorithms to find solutions to problems in a variety of contexts.
- CT3 Application of mathematical models.
- CT4 Use of electronic technology to find solutions to mathematical problems.

Reasoning and Communication

- RC1 Interpretation of mathematical results.
- RC2 Drawing conclusions from mathematical results, with an understanding of their reasonableness and limitations.
- RC3 Use of appropriate mathematical notation, representations, and terminology.
- RC4 Communication of mathematical ideas and reasoning to develop logical arguments.
- RC5 Development and testing of valid conjectures.

**Assessment:**

	<b>Mark</b>	<b>Grade</b>
<b>OVERALL</b>		

*Exponentials & Logarithms***QUESTION 1** (X marks)

a) Simplify:

i.)  $y^3 y^5$

ii.)  $(3x^3)^4$

iii.)  $x + x + x + x + x$

iv.)  $b + b + b + b \times b \times b \times b$

v.)  $\left(\frac{5a^2}{2}\right)^3$

vi.)  $3h^3 \times 4h^6$

vii.)  $\frac{16k^5}{2k^2}$

viii.)  $\frac{2p + 4p^3}{2p}$

b) Write as a single power of 2:

i.)  $\frac{1}{4}$

ii.)  $\sqrt{8}$

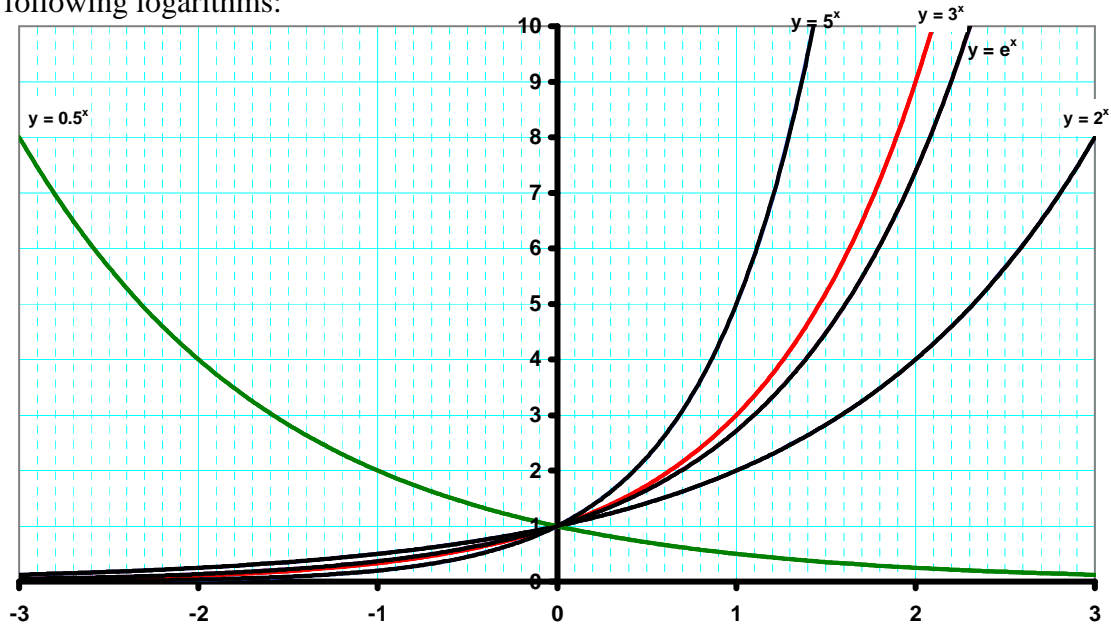
iii.)  $\frac{1}{2\sqrt{2}}$

iv.)  $\sqrt[5]{16}$

# Exponentials & Logarithms

## QUESTION 2 (X marks)

- a) Clearly show how the following graph can be used to approximate the value of each of the following logarithms:



- i)  $\log_3 5$
  - ii)  $\log_{0.5} 6$
  - iii)  $\ln 9$
- b) Find the value of  $x$  in each of the following cases:
- i)  $x = \log_2 8$
  - ii)  $\log_x 36 = 2$
  - iii)  $\log_5 x = 3$
  - iv)  $x = \log_3 3^{0.3}$
  - v)  $\log x = 4$
  - vi)  $\ln x = 2$
  - vii)  $\log 1 = x$
  - viii)  $\ln e^x = 4$

*Exponentials & Logarithms***QUESTION 3** (X marks)

a) Write as a single logarithm:

i)  $\log 5 + \log 6$

ii)  $2\log 4 + 3\log 4$

iii)  $\log 2 + 3$

b) Solve for  $x$  to 4 decimal places:

$$x = \log_3 15$$

c) Solve for  $x$  to 4 decimal places:

$$235 = 46(1.15)^x$$

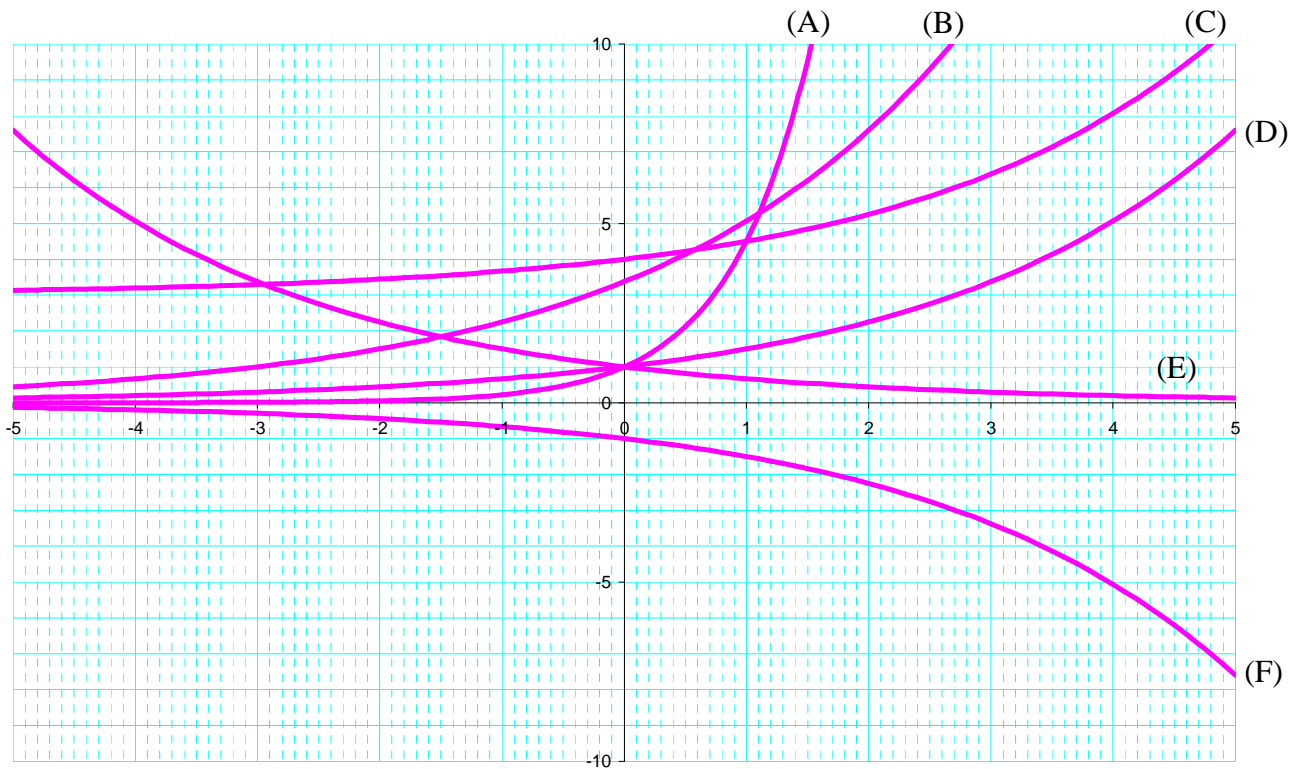
d) Solve for  $x$  to 4 decimal places:

$$1.56 = 0.64x^{0.18}$$

# *Exponentials & Logarithms*

## QUESTION 4 (X marks)

For each of the six graphs shown, choose an appropriate mathematical model from the list below.



Choose from this list of equations:

$$y = 1.5^x$$

$$y = -1.5^x$$

$$y = 1.5^{-x}$$

$$y = (3 \times 1.5)^x$$

$$y = 1.5^{x+3}$$

$$y = 1.5^{x-3}$$

$$y = 1.5^x + 3$$

$$y = 1.5^x - 3$$

## *Exponentials & Logarithms*

### QUESTION 5 (X marks)

- a) If an item is marked-up by 25%, what discount is required to match the final price with the original price?

- b) Write down a mathematical model for the following scenario.  
 “The mass of a bacteria colony, initially 3.6  $\mu\text{g}$ , is growing at a rate of 12% per hour.”

- c) Consider the following table of values.

$t$	1.2	2.8	4.5	7.2
$A$	17.36	3.19	1.23	0.48

Select the most appropriate model from the list below.

- $A = 0.958t^2 - 10.6t + 27.9$
- $A = 22e^{-0.576t}$
- $A = 25t^{-2}$
- $A = 16.8 - 9.6\log t$

Justify your selection.

- d) Mr Borrow purchased a car for \$25,000 and wants to keep track of his car loan. If he borrowed the full amount at a rate of 10.4% p.a. and his bank charges interest monthly, complete the following spreadsheet by entering appropriate *formulae*:

	A	B	C	D	E
1	Month	Start of Month (\$)	Interest in month (\$)	Payment (\$)	End of month (\$)
2	1	\$25,000		(enter payment here)	
3	2			(enter payment here)	

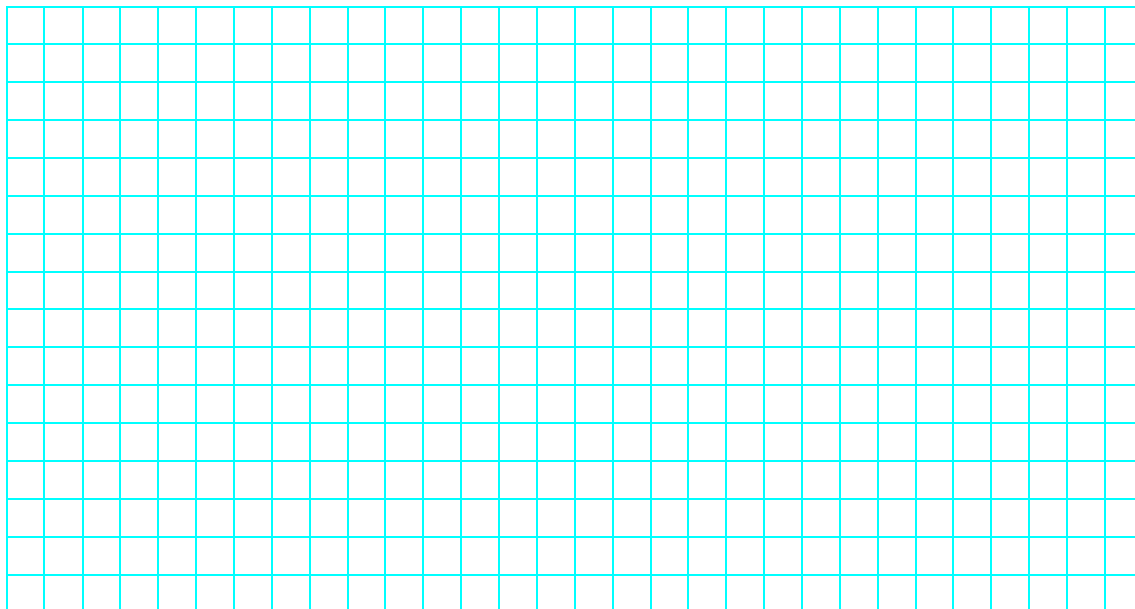
## *Exponentials & Logarithms*

### QUESTION 6 (X marks)

The following data was obtained for a series of engines (for a small boat).

Horse Power	2	5	10	20	25	30	50
Max Speed (km/h)	8.8	12.0	15.1	19.0	20.5	21.8	25.8

Sketch an appropriate graph of this data. Include a line-of-best-fit.



The following model was considered most appropriate:

$S = 6.99(hp)^{0.334}$ , where  $S$  is the maximum speed in km/h and  $hp$  is the number of horse power.

- a) Use the model to predict the maximum speed of a 15 horse power engine to 1 decimal place.
- b) Comment on the expected accuracy of your prediction.
- c) Use the model to predict the maximum speed of a 100 horse power engine to 1 decimal place.
- d) Comment on the expected accuracy of your prediction.
- e) Use the model to suggest the minimum engine size required (to the nearest horse power) for a top speed of 27 km/h.





