

Exponents and Logarithms Revision (Year 10)

Key revision questions from core concepts associated with logarithms and exponents.

NAME: _____

1. Simplify the following exponents and logarithms

a) $\frac{\sqrt[4]{2}}{\sqrt{2}}$

[2]

b) $(5^{2/3})5^{4/3}$

[2]

c) $\frac{\sqrt{q}}{q^2}$

[2]

d) $(b^4)^{1/2} + \left(\frac{2}{3}a^{2/3}\right)^5$

[3]

e) $\log(8) + 2\log(6)$

[1]

f) $\log(3^3) - \frac{2}{3}\log(6)$

[2]

g) $\log_4(13) + 5\log_4(3)$

[2]

h) $\log_5(12^2)$

[2]

i) $\log_a 3 - \log_a 2$

[1]

2. Determine an exact value for x , if $\log_2 64 = x$

[2]

3. Convert the following numbers into surd form

a) $5^{7/3}$

[1]

b) $16^{4/6}$

[1]

c) $p^{9/3}$

[1]

4. Convert the following surds into exponents

a) $\sqrt{17}$

[1]

b) $\sqrt[8/9]{94}$

[1]

c) $^{14/4}\sqrt{788}$

[1]

d) $3\sqrt[5]{13}$

[2]

5. Answer the following question through use of your graphics calculator for the function $f(x) = 3 \log(x)$

a) Find the value of y when $x=2$ and write to three significant figures

b) Find the value of y when $x=3$ and write to three significant figures

[1]

c) Find the value of y when $x=4$ and write to three significant figures

[1]

d) Find the value of y when $x=100$ and write to three significant figures

[1]

e) What is the x intercept of the function?

[1]

f) Define any asymptotes

[2]

g) Describe the behavior of the function as $x \rightarrow +\infty$

[2]

6. Describe the affect that changing the value of a has on the function $f(x)=a \log(x)$

[2]

[3]

7. A function $f(x)$ passes through the points $(0,3)$ and $(1,6)$. Determine the function in the form of ab^x

8. A poster is 15cm in height. The height of the poster is to be as close to 200cm as possible however cannot be greater than this length. The height of a poster is given by $P=15 \cdot 1.5^x$ where x is the number of enlargements. Hence, determine how many times the poster needs to be enlarged to fulfill the requirements. [3]

9. The graph of $y=2 \cdot 3^x$ where $x>0$, is a form of exponential growth [4]
- a) What is meant by the term “aggrandizing rate of change”?

- b) What is the value of y when $x=0$? [2]

[1]

c) Algebraically determine the value of x when $y=10$ and write to three significant figures

[3]

d) Describe the behavior of the function as $x \rightarrow +\infty$

[2]

10. The number of students attending the Australian Spelling and Music School is a form of exponential growth. In 2001, 50 students graduated. Principal Ryde has since determined that the number of students graduating increases by a factor of 1.2 each year.

a) Determine a function that can be used to calculate the number of people graduating t years after 2001 in the form of exponential growth ab^x .

[4]

b) Hence, determine how many people would graduate this year (2013)

[2]

c) Determine how many people would graduate in either 2005 or 2006

d) Determine how many people would graduate in the year 2050 based on this model [3]

11. A population of bacteria in a culture increases according to the model $p = 195(4.7)^{0.01t}$, [2]
where t is the number of hours and $t = 0$ corresponds to 10:00 a.m.

a) Use this model to estimate the number of bacteria at 12.30pm algebraically.

b) Determine the increase in the number of bacteria between 1.00pm and 2.00pm [2]

[4]

- c) Show that the number of bacteria that started in the culture is equal to the value of a for an exponential growth function in the form of ab^x

[3]

12. You purchase a new computer on January 10th 2009 for the price of \$1400. After one year it is worth \$1200. When answering these questions, write answers in the form of t , unless a date is specified.

- a) Write an exponential decay model for the value of the computer in the form of ab^t , where t is the number of years after the computer was purchased

[3]

- b) Graph the model for the interval $0 < x < 10$ clearly showing all values on this interval

[3]

c) Use the model to estimate the value after 10 years

d) Algebraically determine when the computer will be worth \$500

[2]

e) Algebraically determine the value of the computer 2044 days after you purchased it

[3]

f) Algebraically determine the value of the computer on January 10th 2020

[4]

g) Using your calculator, find when the computer will be worth 10% of what was paid for it.

[2]

[1]

h) Determine the date when the computer is worth \$1399 (has lost \$1 off its original value)

[3]

13. Describe (briefly) the relationship that exists between logarithms and exponents.

[2]

14. Use logarithms to solve the following exponential equations

a) $2^x = 14$

[3]

b) $2^{x-5} = 3^x$

[4]

c) $14^{x-7} = 8^{x+2}$

[5]

15. When 13 is raised to some power, x , the result is 7. Determine x to four significant figures.

[3]

16. A rollercoaster accelerates down a hill. Using exponential growth modeling, the velocity of the carriage in ms^{-1} can be modeled by $v(t) = 5(1.6)^t$, for the interval $0 < t < 4$ seconds.

a) Determine the time when the rollercoaster was travelling at $\frac{1}{2}$ of the maximum velocity.

[4]

- b) If Usain Bolt can run with a velocity of 11.2 ms^{-1} , determine when the rollercoaster has a velocity greater than what the world's fastest man can run at.

[3]

- c) What is the velocity change between $t=2$ and $t=3$ seconds?

[3]

The rollercoaster then travels up another hill. Assuming that $t=0$ when the carriage begins to climb the second hill, the rollercoaster's velocity can be modeled by $v(t) = 6(0.72)^t \text{ ms}^{-1}$. If the rollercoaster's velocity drops below 1 ms^{-1} , then it will be unable to continue and make it over the hill.

- d) An engineer wants to build this hill so that it takes 7 seconds for the carriage to make it up the hill. Based on the conditions specified, would the rollercoaster be able to make it over the hill?

[4]