Jakarta International School

8th Grade – AG1

Practice Test -Green

Exponents, Radicals, and the Pythagorean Theorem

Name: Solutions

Date: March 5th & 9th

Score: ___/50

Goal 8: Apply Exponents, Radicals, and the Pythagorean Theorem

****2 Points Per Problem Unless Stated Otherwise****

1. Solve for x

A. $3^x = 9^2 \cdot 3 \cdot 27^3$

$3^x = (3.3)^2 . 3 . (3.3.3)^3$

$3^x = 3^2 . 3^2 . 3 . 3^3 . 3^3 . 3^3$

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

$x = 14$. (2)

B. $16 = 2^{3x-2}$

$4^2 = 2^{3x-2}$

$(2.2)^2 = 2^{3x-2}$

$2^{3x-2} = 2^2 . 2^2$

$2^{3x-2} = 2^{2+2}$

$3x-2 = 4$

$3x-2 = 4$

$\frac{3x}{3} = \frac{6}{3}$

$x = 2$ (2)

C. $p^5\left(\frac{1}{p^2}\right) = p^x$

$p^5 \; p^{-2} = p^x$

$p^x = p^{5+(-2)}$

$x = 3$ (2)

6 points.

2. One circular ice skating stadium for children has a radius of x^2 and the other for adults has a radius which is triple the first. Find the ratio of the area of the larger stadium to the area of the smaller stadium.

Area of circle πr^2

$$\text{Ratio} = \frac{\text{Area of the larger Stadium}}{\text{Area of the smaller stadium}}$$

$$= \frac{\pi (3x^2)^2}{\pi (x^2)^2} = \frac{\pi 9x^4}{\pi x^4} = \frac{9}{1}$$

2 points

Sub total 8 points

The ratio of the area of the larger stadium to the area of the smaller is 9:1

3. Simplify or evaluate the following expressions. Write answers in simplest form.

A. $10^{-2}.10^{0}$ $= \frac{1}{10^2} \cdot 1$ $= \frac{1}{100}$	B. $\left[(-2)^3\right]^2$ $= [-2.-2.-2]^2$ $= [-8]^2$ $= 64$
C. $(3x)^{-2}(-3x)$ $= 3^{-2}.x^{-2}(-3x)$ $= \frac{1}{3^2x^2} \cdot \frac{-3x}{1}$ $= \frac{1}{9x^2} \cdot \frac{-3x}{1} = -\frac{1}{3x}$	D. $(5x)^0 y^{-2}$ $= 1 \cdot \frac{1}{y^2}$ $= \frac{1}{y^2}$.

8 points

4. Make a table of values for the exponential function $y = \left(\frac{1}{3}\right)^x$

- Show how you evaluated at least one input output pair in your table.

x	-2	-1	0	1	2
$y = \left(\frac{1}{3}\right)^x$	9	3	1	$\frac{1}{3}$	$\frac{1}{9}$

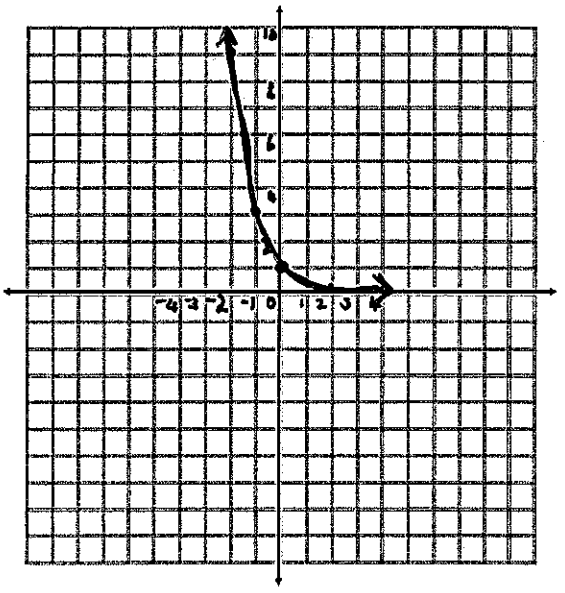
$y = \left(\frac{1}{3}\right)^x$ when $x = -2$

$= \left(\frac{1}{3}\right)^{-2}$

$= \frac{1}{1^2} \div \frac{1}{3^2}$

$= 1 \times 3^2 = 1 \times 9 = 9.$

- Use your table to graph this function.



3 points

Sub total 11 points

5. Simplify the following expressions. Use only positive exponents in your answer.

A. $\dfrac{5x^2y}{3xy^2} \cdot \dfrac{6x^4y^2}{x^2y^2}$

$= \dfrac{30\,x^{2+4} \cdot y^{1+2}}{3\,x^{1+2} \cdot y^{2+2}}$

$= 10\,x^{6-3} \cdot y^{3-4}$

$= 10x^3 \cdot \dfrac{1}{y}$

$= \dfrac{10x^3}{y}$

B. $x^{-8} \cdot x^{10}\left(\dfrac{y^3}{y^5}\right)^{-2}$

$= \dfrac{1}{x^8} \cdot x^{10}\left(\dfrac{y^{-6}}{y^{-10}}\right)$

$= x^{10-8} \cdot \dfrac{1}{y^6} \div \dfrac{1}{y^{10}}$

$= x^2 \cdot \dfrac{1}{y^6} \times \dfrac{y^{10}}{1}$

$= x^2 \cdot y^{10-6}$

$= x^2y^4$

4 points

6. The human body has 1×10^{12} cells. There are 3×10^{10} red blood cells. Find the ratio of red blood cells to the total number of cells and write the number in scientific notation.

$\text{Ratio} = \dfrac{\text{Red blood cells}}{\text{Total number of cells}}$

$= \dfrac{3 \times 10^{10}}{1 \times 10^{12}}$

$= 3 \times 10^{-2}$

2 points

Sub total 6 points

7. Write the number in decimal form.

A. 0.759×10^6	B. 52.4×10^{-4}
$= 0.759000$	$= 0.0052400$
$= 759\,000$	$= 0.000524$

4 points

8. A population of 40 pheasants is released in a wild life preserve. The population doubles each year. What is the population after 4 years?

- Write an exponential growth model
- Evaluate the pheasant population after 4 years?
- Graph the population growth over four years.

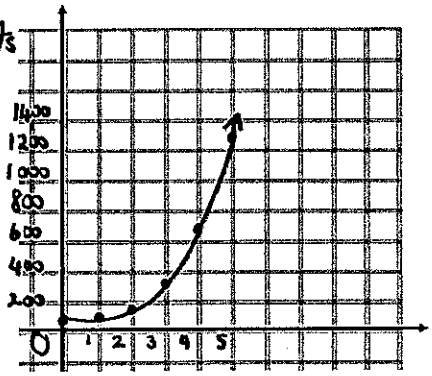
t represents time in years - y represents pheasants

$y = 40(1+1)^t$

$= 40 \cdot 2^4$

$= 640$

The population after 4 years is 640 pheasants



t	0	1	2	3	4	5
y	40	80	160	320	640	1280

3 points

9. Write an exponential growth model for the profit.

A business has a $ 5000 profit in 1990. Then this profit increased by 15% per year for the next 10 years.

$y = 5000(1+0.15)^t$

$= 5000(1.15)^{10}$

2 points

Sub total 9 points

10. Evaluate or simplify the following expressions without using a calculator

A.	Working	B.	Working
$\sqrt{432}$ $= 2.2.3.\sqrt{3}$ $= 12\sqrt{3}$	2 | 432 2 | 216 2 | 108 2 | 54 3 | 27 3 | 9 3 | 3 1	$\sqrt{0.0025x^4y^6z^5}$ $= 0.05\,x^2y^3z^2\sqrt{z}$	$x\cdot x\cdot x\cdot x$ $y\cdot y\cdot y\cdot y\cdot y\cdot y$ $z\cdot z\cdot z\cdot z\cdot z$
C.		D.	
$(-2\sqrt{7})^2$ $= (-2\sqrt{7})(-2\sqrt{7})$ $= 4\sqrt{7.7}$ $= 4\sqrt{49}$ $= 4.7$ $= 28$		$\frac{12}{8\sqrt{15}} = \frac{4}{\sqrt{15}}\cdot\frac{\sqrt{15}}{\sqrt{15}}$ $= \frac{4\sqrt{15}}{15}$	

Sub total 8 points

13. Solve the equations. Write the solutions(s) as simplified as possible.

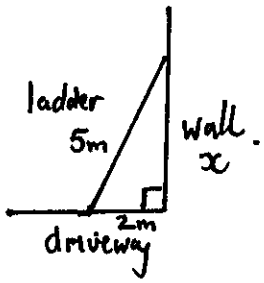
A.	B.
$\frac{3a^2}{3} = \frac{147}{3}$ $\sqrt{a^2} = \sqrt{49}$ $a = \pm 7$	$6x^2 - 54 = 0$ $6x^2 - 54 + 54 = 0 + 54$ $\frac{6x^2}{6} = \frac{54}{6}$ $\sqrt{x^2} = \sqrt{9}$ $x = 3$

4 points

14. A ladder is 5m long. Its foot is on a flat driveway 2m from the base of a vertical wall. How far up the wall will the top of the ladder reach?

- Draw a sketch of the ladder leaning against the wall
- Using the 4 step problem solving process find out how far up the wall the ladder will reach
- Give your answer in its simplest form.

Let x be the height of the wall at the point that the top of the ladder touches it.



$a^2 + b^2 = c^2$

$2^2 + x^2 = 5^2$

$x^2 = 5^2 - 2^2$

$x^2 = 25 - 4$

$\sqrt{x^2} = \sqrt{21}$

$x = \sqrt{21}$.

The ladder touches the wall $\sqrt{21}$ meters from the ground.

4 points

Sub total 8 points