

Name _____ School _____

SENIOR DIVISION
Category 1: Irrational Numbers and Radicals

CALCULATORS NOT ALLOWED

1. (2 pts) Simplify this sum:

1. _____

$$\sqrt[3]{48} + \sqrt[3]{162} + \sqrt[3]{384}$$

2. (3 pts) Rationalize this expression:

2. _____

$$\frac{\sqrt{5} - \sqrt{2}}{\sqrt{5} + \sqrt{2}}$$

3. (5 pts) Find the product:

3. _____

$$(\sqrt{200} + \sqrt{108})(\sqrt{18} - \sqrt{147})$$

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Category 2: Algebraic Fractions

1. (2pts) If $x = 3$, $y = -4$ and $z = 5$, find the exact value of the

expression: $\frac{z(x+2y)^3}{x^3z^2}$

1. _____

2. (3 pts) Simplify this sum: $\frac{x+1}{x+2} + \frac{x+2}{x+1}$

2. _____

3. (5pts) Simplify: $\frac{(x^{2n-1})^2(y^{n+1})^n}{(x^{n+1})(y^{n-1})^n}$

3. _____

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Category 3: Sequences, Series and Progressions

1. (2pts) Given the sequence $a_n = \begin{cases} 1 & \text{if } n \text{ is odd} \\ \frac{2}{n+2} & \text{if } n \text{ is even} \end{cases}$ write the first 6 entries.

_____, _____, _____, _____, _____, _____

2. (3pts) Insert three arithmetic means between 11 and 14.

11, _____, _____, _____, 14

3. (5 pts) Insert two geometric means between 1000 and 64.

1000, _____, _____, 64

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Category 4: Quadratics in One Variable (Pass in only one paper)

1. (2 pts) Find the exact value of the discriminant for the quadratic equation:

$$\sqrt{2}x^2 - 3x + \sqrt{5} = 0$$

The solution(s) to the quadratic equation will be:

Rational Irrational Complex/Imaginary
(circle one)

2. (3pts) A backyard consists of a flower garden, 50 feet long and 30 feet wide, and a walkway of uniform width around it. If the area of the walk is 600 square feet, find its width, correct to two decimal places.

2. _____ feet

3. (5pts) Solve for x : $\sqrt{2x+5} = 5-x$

3. _____