Calculators allowed
Pittsburg State University Algebra Medley - Team Event
Team Member #1 - Operations and Simplifications 2017 Math Relays

Multiple Choice: Select the letter of the most appropriate answer (rounding when appropriate) and shade in the corresponding region on the answer sheet. Assume no variable will cause an expression to be undefined.

1. Simplify $[6+(-4)]^2-[3-(-2)]^3$

A) 129 **B)** -121 **C)** 121 **D)** -129 **E) none**

2. Simplify $(g\circ f)(3)$ **for** $f(x)=x^3-3x+1$ and $g(x)=\dfrac{1}{x+2}$

A) $\dfrac{1}{21}$ **B)** $-\dfrac{1}{21}$ **C)** $\dfrac{51}{125}$ **D)** $-\dfrac{51}{125}$ **E) none**

3. Simplify $\dfrac{56x^5+24x^2+x+2}{8x^2}$

A) $7x^3+\frac{1}{8x}+\frac{1}{4x^2}$ **B)** $7x^{5/2}+3+\frac{1}{8x}+\frac{1}{4x^2}$ **C)** $7x^3+3+\frac{1}{8x}+\frac{1}{4x^2}$ **D)** $7x+\frac{1}{8x}+\frac{1}{(4x)^2}$ **E) none**

4. Simplify $\dfrac{8x^3-64}{x+3}\div\dfrac{2x-4}{2x+6}$

A) $\dfrac{1}{8x^2+10x+32}$ **B)** $8(x^2+5x+4)$ **C)** $8x^2+10x+32$ **D)** $8(x^2+2x+4)$ **E) none**

5. Factor completely: $8x^3+27y^6$

A) $(2x-3y^2)(4x^2+12xy^2+9y^4)$ **B)** $(2x+3y^2)(4x^2-6xy^2+9y^4)$ **C)** $(2x+3y^2)(4x^2-12xy^2+9y^4)$

D) $(2x-3y^2)(4x^2+6xy^2+9y^4)$ **E) none**

6. Combine $-\dfrac{x}{x-2}-\dfrac{7}{x-3}+\dfrac{x^2+10}{x^2-5x+6}$

A) $\dfrac{4x-24}{(x-3)(x-2)}$ **B)** $\dfrac{-4(x-6)}{(x-3)(x-2)}$ **C)** $\dfrac{-4(x+6)}{(x-3)(x-2)}$ **D)** $\dfrac{2x^2-4x+6}{(x-3)(x-2)}$ **E) none**

7. Simplify $\dfrac{\frac{5x+9}{x+5}-x}{1-\frac{2}{x+5}}$

A) $x+3$ **B)** $-x-3$ **C)** $3-x$ **D)** $x-3$ **E) none**

8. Simplify the product of two complex numbers $(5-2i)(2+3i)$

A) $10-6i$ **B)** $10+6i$ **C)** $16-11i$ **D)** $16+11i$ **E) none**

9. Simplify the quotient of two complex numbers $\dfrac{3-2i}{5+i}$

A) $\dfrac{1}{2}-\dfrac{1}{2}i$ **B)** $\dfrac{3}{5}-2i$ **C)** $-\dfrac{7}{10}$ **D)** $-\dfrac{7}{10}i$ **E) none**

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Pittsburg State University Algebra Medley - Team Event
Team Member #2 - Exponents and Radicals 2017 Math Relays

Multiple Choice: Select the letter of the most appropriate answer (rounding when appropriate) and shade in the corresponding region on the answer sheet. Assume no variable will cause an expression to be undefined.

10. Simplify $3\sqrt{15} - 2\sqrt{15x^2}, x > 0$

A) $(3-2x)\sqrt{15}$ **B)** $3\sqrt{15}+2x\sqrt{15}$ **C)** $x\sqrt{15}$ **D)** $6x\sqrt{16}$ **E) none**

11. Simplify (rationalize) $\dfrac{3}{\sqrt{5x}-\sqrt{2}}$

A) $\dfrac{3\sqrt{5x}}{5x} - \dfrac{3\sqrt{2}}{2}$ **B)** $\dfrac{3\sqrt{5x}}{5x} + \dfrac{3\sqrt{2}}{2}$ **C)** $\dfrac{3\sqrt{5x}+3\sqrt{2}}{5x-2}$ **D)** $\dfrac{3\sqrt{5x}+3\sqrt{2}}{25x^2-4}$ **E) none**

12. Simplify $\sqrt{\dfrac{18x^7y^3}{25x^{16}y}}, x, y > 0$

A) $\dfrac{6y}{5x^4\sqrt{x}}$ **B)** $\dfrac{3y\sqrt{2}}{5x^3}$ **C)** $\dfrac{3\sqrt{2y}}{5x^4\sqrt{x}}$ **D)** $\dfrac{3y\sqrt{2}}{5x^4\sqrt{x}}$ **E) none**

13. Simplify so that no negative exponents appear in the final result: $\dfrac{(5a^2b^{-2})^2}{(a^3b)^{-5}}$

A) $\dfrac{25a^{19}}{b}$ **B)** $\dfrac{25a^{19}}{b}$ **C)** $\dfrac{25b}{a^{19}}$ **D)** $\dfrac{10a^{19}}{b}$ **E) none**

14. Expand and simplify: $3(2-x)^{-2}$

A) $-\dfrac{1}{3x^2}+\dfrac{1}{12x}-\dfrac{1}{12}$ **B)** $\dfrac{1}{3x^2}-\dfrac{1}{12x}+\dfrac{1}{12}$ **C)** $-3x^2+12x-12$ **D)** $3x^2-12x+12$ **E) none**

15. Simplify $\sqrt[4]{16(5x)^2y^{-3}}, x, y > 0$

A) $\dfrac{8\sqrt{5x}}{\sqrt[4]{y^3}}$ **B)** $\dfrac{2\sqrt[4]{5x}}{\sqrt{y^3}}$ **C)** $\dfrac{2\sqrt{5x}}{\sqrt[4]{y^3}}$ **D)** $\dfrac{4\sqrt{5x}}{\sqrt[4]{y^3}}$ **E) none**

16. Simplify $\dfrac{4x^{-3}-x^{-2}}{x^{-1}+y^{-3}}$

A) $\dfrac{-xy^3+4y^3}{x^3+x^2y^3}$ **B)** $\dfrac{x+y^3}{4x^3+x^2}$ **C)** $\dfrac{-xy^3-4y^3}{x^3+x^2y^3}$ **D)** $\dfrac{x-y^3}{4x^3+x^2}$ **E) none**

17. Simplify $\sqrt[3]{-27\cdot x^3}$, for any real number x

A) $-3|x|$ **B)** $-3x$ **C)** $-9x$ **D)** $-9|x|$ **E) none**

18. Simplify $\sqrt{4\cdot x^2}$, for any real number x

A) $2|x|$ **B)** $2x$ **C)** $4x^2$ **D)** $4|x|$ **E) none**

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Pittsburg State University Algebra Medley - Team Event
Team Member #3 - Equations and Inequalities 2017 Math Relays

Multiple Choice: Select the letter of the most appropriate answer (rounding when appropriate) and shade in the corresponding region on the answer sheet. Find the solution set to each equation or inequality.

19. Solve: $3x^3 + 9x^2 + 2x = 0$

A) $\left\{0, \frac{9 \pm \sqrt{57}}{6}\right\}$ **B)** $\left\{\frac{-9 \pm \sqrt{57}}{6}\right\}$ **C)** $\left\{0, \frac{-9 \pm \sqrt{57}}{6}\right\}$ **D)** $\left\{\frac{9 \pm \sqrt{57}}{6}\right\}$ **E) none**

20. Solve: $2x^3 - 3x^2 - 18x + 33 = 6$

A) $\left\{-3, 0, \frac{3}{2}, 3\right\}$ **B)** $\left\{-3, \frac{3}{2}, 3\right\}$ **C)** $\left\{-3, -\frac{3}{2}, 3\right\}$ **D)** $\left\{-3, -\frac{2}{3}, 3\right\}$ **E) none**

21. Solve: $\frac{x^2}{x-3} = \frac{18}{2x-6}$

A) $\emptyset$ **B)** $\{3\}$ **C)** $\{-3\}$ **D)** $\{-3, 3\}$ **E) none**

22. For what value(s) of b are the two roots of $4x^2 - bx + 9 = 0$ equal?

A) $\{\pm 12\}$ **B)** $\{12\}$ **C)** $\{-6\}$ **D)** $\{-6, 6\}$ **E) none**

23. Solve: $x = \sqrt{x+2} + 7$

A) $\left\{\frac{15 \pm \sqrt{37}}{2}\right\}$ **B)** $\left\{\frac{15 - \sqrt{37}}{2}\right\}$ **C)** $\emptyset$ **D)** $\left\{\frac{15 + \sqrt{37}}{2}\right\}$ **E) none**

24. Find the solution set (interval notation) to: $|2x + 3| \geq 7$

A) $(\infty, -2] \cup [5, \infty)$ **B)** $(\infty, -5] \cup [2, \infty)$ **C)** $(\infty, -2) \cup (5, \infty)$ **D)** $(\infty, -5) \cup (2, \infty)$ **E) none**

25. Find the solution set (interval notation) to: $12x^2 - 2x - 2 < 0$

A) $\left(-\frac{1}{2}, \frac{1}{3}\right)$ **B)** $\left(-\frac{1}{3}, \frac{1}{2}\right)$ **C)** $\left[-\frac{1}{3}, \frac{1}{2}\right]$ **D)** $\left[-\frac{1}{2}, \frac{1}{3}\right]$ **E) none**

26. Solve: $\log_2(x^2 - 6x) = 3 + \log_2(1 - x)$

A) $\{-4\}$ **B)** $\{-6, 4\}$ **C)** $\{2\}$ **D)** $\{-4, 2\}$ **E) none**

27. Solve: $4^{2x-1} \cdot 16^{3x-2} = 6$

A) $\frac{\log_4(16) - 5}{2}$ **B)** $\frac{\log_4(6) + 5}{2}$ **C)** $\frac{\log_4(6) + 5}{8}$ **D)** $\frac{\log_4(16) + 5}{2}$ **E) none**

Calculators allowed
Pittsburg State University Algebra Medley - Team Event
Team Member #4 - Word Problems **2017 Math Relays**

Multiple Choice: Select the letter of the most appropriate answer (rounding when appropriate) and shade in the corresponding region on the answer sheet.

28. There are 498 trees in an orchard. There are five times as many apple trees as pear trees. How many apple trees are there?

A) 410 trees **B)** 415 trees **C)** 83 trees **D)** 82 trees **E) none**

29. How many different ways can we choose a committee of 3 students and 4 professors from a group of 7 students and 9 professors (on the committee, there is no ranking or ordering of the people).

A) 11440 ways **B)** 4410 ways **C)** 63 ways **D)** 12 ways **E) none**

30. Summer can type 4980 words per hour. How many words can she type in 3 minutes?

A) 249 words **B)** 240 words **C)** 246 words **D)** 270 words **E) none**

31. A rectangular garden has an area of 7275 square feet and perimeter of 344 feet. Its length is shorter than its width. Find it's width.

A) 75 ft **B)** 91 ft **C)** 97 ft **D)** 77 ft **E) none**

32. A rocket is ascending straight up at constant velocity. The altitude is measured to be 2000 ft at 6 seconds after launch, and 30270 ft at 17 seconds after launch. How fast is the rocket ascending?

A) 2570 ft/sec **B)** 2590 ft/sec **C)** 2560 ft/sec **D)** 2520 ft/sec **E) none**

33. Working alone, Kevin takes 2 hours to mow the yard. His roommate Seth, working alone, takes 3 hours to mow the same yard. How long will it take them to mow the yard working together?

A) $\frac{2}{5}$ hours **B)** 1 hours **C)** $\frac{5}{6}$ hours **D)** $\frac{6}{5}$ hours **E) none**

34. In 2017, a university found enrollment is increasing by about 2.5% every year. In 2017, the university had $2,308$ enrolled students. Assuming the trend continues, estimate enrollment in year 2023.

A) 2677 students **B)** 2654 students **C)** 3432 students **D)** 2532 students **E) none**

35. An airliner can fly $2,800$ miles in 5 hours. A new airliner is 5% faster. How long will it take the new airliner to fly $2,900$ miles?

A) 4.5 hours **B)** 5.11 hours **C)** 4.83 hours **D)** 4.93 hours **E) none**

36. Suppose A varies jointly with B and C: directly with the square of B and inversely with C. When $A = 3$, $B = 2$ and $C = 5$. Find the value of A when $B = 3$ and $C = 2$.

A) $\frac{125}{6}$ **B)** $\frac{6}{125}$ **C)** $\frac{135}{8}$ **D)** $\frac{8}{135}$ **E) none**

Thank you for participating in the Pittsburg State Math Relays!