

Name:
Teacher:

Date:
Class/Period:

1) Aileen and Emily are college roommates. Working together it takes them 45 minutes to clean their dorm room. Today is Aileen's day to clean. She can clean the room by herself in $\frac{2}{3}$ the time Emily takes by herself. How long, in minutes, will it take Aileen to clean the room by herself?

- A. 112.5
- B. 75.0
- C. 60.0
- D. 30.0

2) Miriam plans to have a party for her friends. Research shows that the number of hours needed to prepare for an event varies inversely as the sum of 5 and the square of the number of people involved in the preparation. If 2 people prepare for the party, it takes them 20 hours to complete the job. If Miriam plans to spend only 6 hours to prepare for the party, how many people should help prepare for the party?

- A. 4
- B. 5
- C. 7
- D. 8

3) One printer takes 3 hours to complete a job. Another printer can do the same job in 4 hours. When the job runs on both printers, how many hours will it take to complete?

- A. $\frac{7}{24}$
- B. $\frac{7}{12}$
- C. $\frac{12}{7}$
- D. $\frac{24}{7}$

4) What is the solution set of $\frac{1}{x} + \frac{1}{x+2} = \frac{5}{12}$?

A. {1.2}

B. {7.6}

C. {-1.2, 4}

D. $\left\{ \frac{-8 \pm \sqrt{145}}{5} \right\}$

5) One ballot processing machine (A) can tabulate 7,000 votes per hour and another (B) can tabulate 10,000 votes per hour. Machine A starts at 9:00 a.m., Machine B starts at 1:00 p.m., and the machines finish at the same time. To the nearest minute, when will the 2 machines finish tabulating 121,500 votes?

A. 6:30 p.m.

B. 4:09 p.m.

C. 2:21 p.m.

D. 1:09 p.m.

6) While working on a resistance problem, an electrical engineer encounters the equation $\frac{3x-5}{x^2-2x-3} - \frac{2x+5}{x^2-x-2} = 0$. Before continuing her work, she must solve the equation. If only nonnegative values are acceptable, what solution(s) will she find?

A. 5

B. 10

C. 1 and 0

D. 2 and 3

7) A business owner spent \$500 on start-up fees to produce and sell candles. Each candle costs an additional \$3.00 to produce. What is the minimum number of candles that the owner must produce for the average cost per candle to be less than \$3.75 ?

A. 134

B. 167

C. 375

D. 667

8) At a hot dog eating contest, Kyra can steadily eat a hot dog every 15 seconds. Alan is a little slower; at his steady pace, he can eat one every 18 seconds. How long will it take the team of Kyra and Alan to polish off a plate of 22 hot dogs?

- A. 2 min
- B. 2 min 30 sec
- C. 3 min
- D. 3 min 30 sec

9) Given $x > 0$, $y > 0$, which expression is equivalent to:

$$\frac{\sqrt[3]{27x^5} \sqrt[4]{32y^4}}{\sqrt{8x^8y^6}}$$

- A. $\frac{3\sqrt[3]{x^2} \sqrt[4]{4}}{2x^3y^2}$
- B. $\frac{3\sqrt{2} \sqrt[3]{x^2} \sqrt[4]{2}}{2x^3y^2}$
- C. $\frac{3\sqrt[3]{x^2} \sqrt[4]{2}}{\sqrt{2}x^3y^2}$
- D. $\frac{18\sqrt[3]{x^2}}{x^3y^2}$

10) Completely simplify $\frac{\sqrt[3]{162k^{162}}}{\sqrt[3]{32}}$.

- A. $\frac{3\sqrt[3]{3}k^{54}}{2}$
- B. $\frac{3\sqrt[3]{12}k^{54}}{4}$
- C. $\frac{9k^{81}}{2}$
- D. $\frac{27k^{54}}{2}$

11) Determine the greatest value of x for which

$$\frac{(x+10)(x+5)(x+3)}{x^2-25} = 1.$$

- A. -3
- B. -5
- C. -7
- D. -12

12) Rationalize the denominator and simplify: $\frac{4+\sqrt{6}}{4+\sqrt{2}}$

- A. $\frac{8-\sqrt{2}}{7}$
- B. $\frac{8-2\sqrt{2}-\sqrt{3}+2\sqrt{6}}{7}$
- C. $8+2\sqrt{2}-\sqrt{3}+2\sqrt{6}$
- D. $\frac{16-4\sqrt{2}-2\sqrt{3}+4\sqrt{6}}{14}$

13) Variables a , b , and c are real numbers where $b = c^2$ and $a = b^3$. Write $\sqrt[3]{ac} + \sqrt[3]{b^2}$ in terms of c .

- A. $(2c^2)\sqrt[3]{c}$
- B. $c^2\sqrt[3]{c} + c\sqrt[3]{c}$
- C. $2c\sqrt[3]{c}$
- D. $(c^6 + c)\sqrt[3]{c}$

- 14) Rewrite this expression in simplest form. Assume variables represent positive numbers.

$$\sqrt{\frac{16w^2y^3}{75x^5}}$$

- A. $\frac{\sqrt{3xy}}{3x}$
B. $\frac{4wy\sqrt{3xy}}{15x^3}$
C. $\frac{4wy^2\sqrt{5xy}}{25x^3}$
D. $\frac{4wy^2\sqrt{3xy}}{15x^3}$

- 15) Mr. Johnson bought a conical camping tent for his 2 daughters. The radius of the circular base of the tent measures 4.5 ft, and the tent's lateral surface area is 110.6 ft². Use the formula $S = \pi r\sqrt{r^2 + h^2}$, where S is the lateral surface area and r is the radius, to find the height, h , of the tent, to the nearest tenth of a foot.

(Note: $\pi \approx 3.14$)

- A. 3.3
B. 6.3
C. 6.4
D. 8.2
- 16) Scientists use the Beaufort wind scale to approximate wind speed. The formula is $B = 1.69\sqrt{s + 4.45} - 3.49$, where B is the Beaufort number and s is the wind speed in miles per hour. To the nearest mile per hour, what is the approximate wind speed if the Beaufort number is 6?
- A. 2
B. 12
C. 27
D. 253

17) Given:

$$b = \sqrt{a}$$

$$c = a^2$$

$$d = b^2c$$

Which expression is equivalent to $\frac{d^2b}{ac}$ in terms of a ?

A. $a^3\sqrt{a}$

B. $a^7\sqrt{a}$

C. a^9

D. a^{12}

18) Annabel and Makenna are painting the inside walls of identical houses. Each house needs the same number of identical rooms painted. Assume that Annabel and Makenna each work at their respective constant rates whether they work alone or together. It takes Annabel 18 hours to paint the inside walls of a house. It takes Makenna 24 hours to paint the inside walls of a house.

A. Find how long, x , it takes Annabel and Makenna to paint the inside walls of a house together. Use the equation $\frac{1}{18} + \frac{1}{24} = \frac{1}{x}$. Round your answer to the nearest tenth of an hour. Show your algebraic work, and explain the approach you used to find your answer.

B. A student solves the equation and gets an answer of $x = 50$. Within the context of the problem, explain why the student's answer is not reasonable.

19) Consider the functions $f(x) = 1 + \sqrt{7 - 2x}$ and $g(x) = \frac{1}{3 - \sqrt{x+5}}$.

A. What is the exact value of $f(-10)$? Simplify your answer completely. Show your work algebraically, and explain the approach you used to find your answer.

B. What is the domain of $g(x)$? Explain how you determined your answer.

C. Simplify $f(x) \cdot g(x)$ such that there are no square roots in the denominator of the expression. Show your work algebraically.

Please use the space below to write your response(s) to the writing assignment provided by your teacher. If there are multiple tasks to the question, please clearly label the number or letter of each task in the column to the left of your answers. If you need additional pages for your response, your teacher can provide them.

Please write the name of the writing assignment here: _____

Task



Reference Sheet for the QualityCore™ Algebra II End-of-Course Assessment

Equations of a Line

Standard Form	$Ax + By = C$	A , B , and C are constants with A and B not both equal to zero.
Slope-Intercept Form	$y = mx + b$	(x_1, y_1) is a point.
Point-Slope Form	$y - y_1 = m(x - x_1)$	m = slope b = y-intercept

Quadratics

Standard Form of a Quadratic Equation	$ax^2 + bx + c = 0$	a , b , and c are constants, where $a \neq 0$.
Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	

Conic Sections

Circle	$(x - h)^2 + (y - k)^2 = r^2$	center (h, k) r = radius
Parabola	$y = a(x - h)^2 + k$	axis of symmetry $x = h$ vertex (h, k) directrix $y = k - \frac{1}{4a}$ focus $(h, k + \frac{1}{4a})$
Parabola	$x = a(y - k)^2 + h$	axis of symmetry $y = k$ vertex (h, k) directrix $x = h - \frac{1}{4a}$ focus $(h + \frac{1}{4a}, k)$
Ellipse	$\frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1$	foci $(h \pm c, k)$ where $c^2 = a^2 - b^2$, center (h, k)
Ellipse	$\frac{(y - k)^2}{a^2} + \frac{(x - h)^2}{b^2} = 1$	foci $(h, k \pm c)$ where $c^2 = a^2 - b^2$, center (h, k)
Hyperbola	$\frac{(x - h)^2}{a^2} - \frac{(y - k)^2}{b^2} = 1$	foci $(h \pm c, k)$ where $c^2 = a^2 + b^2$, center (h, k)
Hyperbola	$\frac{(y - k)^2}{a^2} - \frac{(x - h)^2}{b^2} = 1$	foci $(h, k \pm c)$ where $c^2 = a^2 + b^2$, center (h, k)

Lines and Points

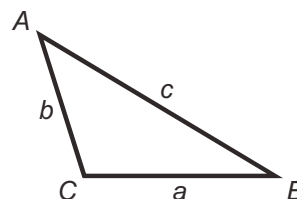
Slope	$m = \frac{y_2 - y_1}{x_2 - x_1}$	(x_1, y_1) and (x_2, y_2) are 2 points. m = slope
Midpoint	$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$	M = midpoint d = distance
Distance	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	

Miscellaneous

Distance, Rate, Time	$D = rt$	$D =$ distance $r =$ rate $t =$ time
Simple Interest	$I = prt$	$I =$ interest $p =$ principal
Compound Interest	$A = p\left(1 + \frac{r}{n}\right)^{nt}$	$A =$ amount of money after t years $n =$ number of times interest is compounded annually
Pythagorean Theorem	$a^2 + b^2 = c^2$	a and $b =$ legs of right triangle $c =$ hypotenuse

Laws of Sines and Cosines

Law of Sines	$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$
Law of Cosines	$a^2 = b^2 + c^2 - 2bc \cos A$



Sequences, Series, and Counting

Arithmetic Sequence	$a_n = a_1 + (n - 1)d$	$a_n =$ n^{th} term
Arithmetic Series	$s_n = \frac{n}{2}(a_1 + a_n)$	$n =$ number of the term $d =$ common difference
Geometric Sequence	$a_n = a_1(r^{n-1})$	$s_n =$ sum of the first n terms $r =$ common ratio
Geometric Series	$s_n = \frac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$	$k =$ number of objects in the set $m =$ number of objects selected
Combinations	${}_k C_m = C(k, m) = \frac{k!}{(k-m)! m!}$	
Permutations	${}_k P_m = P(k, m) = \frac{k!}{(k-m)!}$	

Circumference, Area, and Volume

Triangle	$A = \frac{1}{2}bh$	$A =$ area $b =$ base $h =$ height
Parallelogram	$A = bh$	$r =$ radius
Trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$	$C =$ circumference $d =$ diameter
Circle	$A = \pi r^2$ $C = \pi d$	$V =$ volume
General Prism	$V = Bh$	$B =$ area of base $\pi \approx 3.14$
Right Circular Cylinder	$V = \pi r^2 h$	
Pyramid	$V = \frac{1}{3}Bh$	
Right Circular Cone	$V = \frac{1}{3}\pi r^2 h$	
Sphere	$V = \frac{4}{3}\pi r^3$	

Answer Key

- 1) B
- 2) B
- 3) C
- 4) C
- 5) A
- 6) A
- 7) D
- 8) C
- 9) C
- 10) B
- 11) C
- 12) B
- 13) B
- 14) B
- 15) C
- 16) C
- 17) A

Scoring Criteria:

18)

A 4-point response may include, but is not limited to, the following points:

A. Correct amount of time when working together: 10.3 hr

Appropriate work needed to find the answer:

$$18 = 6 \times 3$$

$$24 = 6 \times 4$$

$$\text{LCM of 18 and 24} = 6 \times 3 \times 4 = 72$$

$$72 \left(\frac{1}{18} + \frac{1}{24} \right) = 72 \left(\frac{1}{x} \right)$$

$$4 + 3 = \frac{72}{x}$$

$$7x = 72$$

$$x = \frac{72}{7}$$

$$x = 10.3$$

Explanation of the approach used to find the answer: First, I found the least common multiple of the numerical denominators. I multiplied both sides of the equations by 72. Then, I simplified and solved for x , rounding my answer to the nearest tenth.

Note: There are other ways to solve the equation.

B. Explanation of why the student's answer is not reasonable: It cannot take Annabel and Makenna more hours to paint the inside walls of a house together than it takes either one of them by themselves.

Rubric:

- 4 A response at this level provides evidence of thorough knowledge and understanding of the subject matter.**
- The response addresses all parts of the question or problem correctly.
 - The response demonstrates efficient and accurate use of appropriate procedures.
 - The explanation of strategies used in the response shows evidence of a good understanding of mathematical concepts and principles, and it does not contain any misconceptions.
 - The explanation in the response is clear and coherent.
- 3 A response at this level provides evidence of competent knowledge and understanding of the subject matter.**
- The response addresses most parts of the question or problem correctly.
 - The response includes some minor errors but generally uses appropriate procedures accurately.
 - The explanation of strategies used in the response shows some evidence of a good understanding of mathematical concepts and principles, and it contains few, if any, misconceptions.
 - The explanation in the response is mostly clear and coherent.
- 2 A response at this level provides evidence of a basic knowledge and understanding of the subject matter.**
- The response addresses some parts of the question or problem correctly.
 - The response includes a number of errors but demonstrates some use of appropriate procedures.
 - The explanation of strategies used in the response shows a little evidence of understanding of mathematical concepts and principles, but it may contain some evidence of misconceptions.
 - The explanation in the response is partially clear, but some parts may be difficult to understand.
- 1 A response at this level provides evidence of minimal knowledge and understanding of the subject matter.**
- The response addresses a few parts of the problem correctly, but the response is mostly incorrect.
 - The response includes inappropriate procedures or simple manipulations that show little or no understanding of correct procedures.
 - The explanation of strategies used in the response shows little or no evidence of understanding of mathematical concepts and principles, and it may contain evidence of significant misconceptions.
 - Many parts of the explanation are difficult to understand.
- 0 A response at this level is not scorable.** The response is off-topic, blank, hostile, or otherwise not scorable.

Scoring Criteria:

19) A 4-point response may include, but is not limited to, the following points:

A. **Correct value:** $1 + 3\sqrt{3}$

Appropriate work needed to find the answer:

$$f(-10) = 1 + \sqrt{7 - 2(-10)} = 1 + \sqrt{7 + 20} = 1 + \sqrt{27} = 1 + \sqrt{9 \cdot 3} = 1 + 3\sqrt{3}$$

Explanation of the approach used to find the answer: I substituted -10 for x in $f(x)$. I simplified the expression under the radical to 27. Then, I broke 27 into 9, the highest perfect square that is a factor of the expression, and 3. Then, I simplified $\sqrt{9}$ as 3.

B. **Correct domain:** $\{x : x \geq -5, \text{ except } x = 4\}$

Explanation of how the answer was determined: To find the domain, I needed to determine when the denominator equaled zero and when the expression under the radical sign was negative. First, I set the denominator equal to zero. I added $\sqrt{x+5}$ to both sides of the equation, and squared both sides. I subtracted 5 from both sides of the equation. The denominator equaled zero when x was 4, so I eliminated 4 from the domain of the function. Then, I set up an inequality to show when the expression under the radical was less than zero (negative). I subtracted 5 from both sides of the inequality. The expression under the radical was negative when $x < -5$, so I eliminated $x < -5$ from the domain. Using both sets of exclusions, I found that the domain had to be greater than or equal to -5 except for the case when $x = 4$.

C. **Correct expression:**
$$\frac{3 + \sqrt{x+5} + 3\sqrt{7-2x} + \sqrt{-2x^2 - 3x + 35}}{-x + 4}$$

Appropriate work needed to find the answer:

$$\begin{aligned} f(x) \cdot g(x) &= (1 + \sqrt{7-2x}) \cdot \left(\frac{1}{3 - \sqrt{x+5}} \right) = \frac{1 + \sqrt{7-2x}}{3 - \sqrt{x+5}} \\ \frac{(1 + \sqrt{7-2x})}{(3 - \sqrt{x+5})} \cdot \frac{(3 + \sqrt{x+5})}{(3 + \sqrt{x+5})} &= \frac{3 + \sqrt{x+5} + 3\sqrt{7-2x} + \sqrt{(7-2x)(x+5)}}{9 + 3\sqrt{x+5} - 3\sqrt{x+5} - \sqrt{(x+5)^2}} = \\ \frac{3 + \sqrt{x+5} + 3\sqrt{7-2x} + \sqrt{-2x^2 - 3x + 35}}{9 - (x+5)} &= \\ \frac{3 + \sqrt{x+5} + 3\sqrt{7-2x} + \sqrt{-2x^2 - 3x + 35}}{-x + 4} \end{aligned}$$

Rubric:

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- The response addresses all parts of the question or problem correctly.
 - The response demonstrates efficient and accurate use of appropriate procedures.
 - The explanation of strategies used in the response shows evidence of a good understanding of mathematical concepts and principles, and it does not contain any misconceptions.
 - The explanation in the response is clear and coherent.
- 3 A response at this level provides evidence of competent knowledge and understanding of the subject matter.**
- The response addresses most parts of the question or problem correctly.
 - The response includes some minor errors but generally uses appropriate procedures accurately.
 - The explanation of strategies used in the response shows some evidence of a good understanding of mathematical concepts and principles, and it contains few, if any, misconceptions.
 - The explanation in the response is mostly clear and coherent.
- 2 A response at this level provides evidence of a basic knowledge and understanding of the subject matter.**
- The response addresses some parts of the question or problem correctly.
 - The response includes a number of errors but demonstrates some use of appropriate procedures.
 - The explanation of strategies used in the response shows a little evidence of understanding of mathematical concepts and principles, but it may contain some evidence of misconceptions.
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