

All answers posted at the back of this document.

Unit 10 Test Study Guide
(Rational Expressions & Equations)

Name: _____

Date: _____ Per: _____

Topic 1: Simplifying Rational Expressions (1) GCF (2) factor

Directions: Simplify each expression.

<p>1. $\frac{16xy^5}{42x^2y^3}$</p> <p>$\frac{8y^2}{21x}$</p>	<p>2. $\frac{r^2 + 2r}{5r + 10}$</p> <p>$\frac{r(r+2)}{5(r+2)} = \frac{r}{5}$</p>
<p>3. $\frac{6k^2 - 11k + 4}{9k^2 - 16}$</p> <p>$\frac{(3k-4)(2k-1)}{(3k+4)(3k-4)}$</p> <p>$\frac{2k-1}{3k+4}$</p>	<p>4. $\frac{y^3 - y}{y^3 + 8y^2 - 9y}$</p> <p>$\frac{y(y^2 - 1)}{y(y^2 + 8y - 9)}$</p> <p>$\frac{y(y-1)(y+1)}{y(y-1)(y+9)}$</p> <p>$\frac{y+1}{y+9}$</p>

Topic 2: Operations with Rational Expressions

Directions: Perform the indicated operation. Give each answer in simplest form.

5. $\frac{5v^3}{7v^2} \cdot \frac{2v^2}{4v} = \frac{3v^2}{4}$

6. $\frac{a^2 + a - 6}{a^2 - a - 2} \cdot \frac{a^2 + 5a + 4}{a^2 + 2a - 3}$

7. $\frac{(10m+10)(2m^2+m-3)}{(8m^2+12m)(m^2-1)} \div \frac{3m}{2m-3}$

$\frac{10(m+1)(2m+3)(m-1)}{4m(2m+3)(m+1)(m-1)} \cdot \frac{2m-3}{3m}$

$\frac{10}{4m} = \frac{5}{2m}$

8. $\frac{6q^5}{8q^5} \div \frac{9q}{8q^2}$

9. $\frac{c^2 - 6c + 8}{c^2 - 2c} \div \frac{1}{3(c-12)}$

$\frac{(c-2)(c-4)}{c(c-2)} \cdot \frac{1}{3(c-4)}$

$\frac{1}{3c}$

10. $\frac{p^2 - 36}{2p^2 + 3p + 1} \div \frac{4p - 24}{8p + 4}$

<p>11. $\frac{3x+10}{x^2-49} + \frac{x+18}{x^2-49}$ ✓</p> <p>$\frac{3x+10+x+18}{x^2-49} = \frac{(4x+28)}{(x^2-49)}$</p> <p>$\frac{4}{x-7}$ (circled)</p> <p>$\frac{4(x+7)}{(x+7)(x-7)}$</p>	<p>12. $\frac{n^2+7n}{n^2+4n-32} - \frac{n+16}{n^2+4n-32}$ ✓</p> <p>$\frac{n^2+7n-(n+16)}{(n^2+4n-32)} = \frac{n^2+6n-16}{n^2+4n-32}$</p> <p>$\frac{(n+8)(n-2)}{(n+8)(n-4)}$</p> <p>$\frac{8}{4} = 2$ (crossed out)</p>
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<p>13. $\frac{5}{18z} + \left(\frac{1}{2z}\right)^9$</p> <p>$\frac{5+9}{18z} = \frac{14}{18z} = \frac{7}{9z}$ (circled)</p>	<p>14. $\frac{6r-2}{10r-20} \left(\frac{1}{r-2}\right)^{10}$</p> <p>$\frac{6r-2}{10(r-2)} = \frac{10}{(r-2)10} = \frac{(6r-12)}{(r-2)10}$</p> <p>$\frac{3}{5} = \frac{3(6r-12)}{5(10(r-2))}$ (circled)</p>
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<p>15. $\frac{k^2-10k+1}{5k^2-2k-3} + \frac{1}{k-1}$</p>	<p>16. $\frac{v+1}{v+5} + \frac{5v-11}{(v+5)(v-4)}$</p> <p>$\frac{(v+1)(v-4) + 5v-11}{(v+5)(v-4)}$</p> <p>$\frac{v^2-3v-4+5v-11}{(v+5)(v-4)}$</p> <p>$\frac{v^2+2v-15}{(v+5)(v-4)}$</p> <p>$\frac{(v-3)(v+5)}{(v+5)(v-4)}$</p> <p>$\frac{-15}{3 \times 5} = -1$ (crossed out)</p>
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Topic 3: Rational Equations

Directions: Solve each equation.

17. $\frac{x+2}{-6} = \frac{2x-10}{8}$

$8x + 16 = 12x - 60$
 $-8x + 160 = -8x + 60$
 $76 = 4x$
 $19 = x$

18. $\frac{r+1}{4} = \frac{14}{r}$

19. $\frac{8}{3a} = \frac{a}{3a}$ - or -

$48 = 3a^2$
 $\sqrt{16} = a^2$
 $\pm 4 = a$

$3a^2 - 48 = 0$
 $3(a^2 - 16)$
 $3(a-4)(a+4)$
 $4, -4$

20. $\frac{w-7}{6} = \frac{4}{w+3}$

$w^2 - 4w - 21 = 24$
 $w^2 - 4w - 45 = 0$
 $(w-9)(w+5) = 0$
 $9, -5$

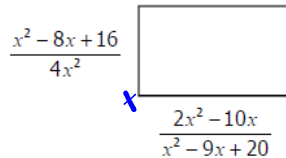
21. $\frac{2}{c-3} - \frac{1}{4c-12} = \frac{2}{c-5}$

22. $\frac{7}{12y} - \frac{1}{6y} = \frac{y-1}{y+1}$

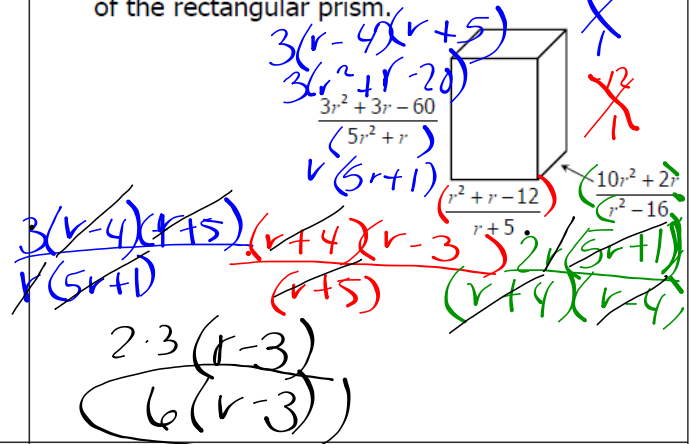
$(y+1)5 = (y-1)12$
 $5y + 5 = 12y - 12$
 $-5y + 5 = -5y - 5$
 $12y^2 - 17y - 5 = 0$
 $(3y-5)(4y+1) = 0$
 $\frac{5}{3}, -\frac{1}{4}$

Topic 4: Applications with Rational Expressions

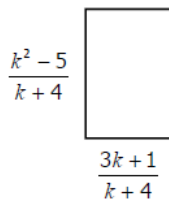
23. Write an expression to represent the **area** of the rectangle.



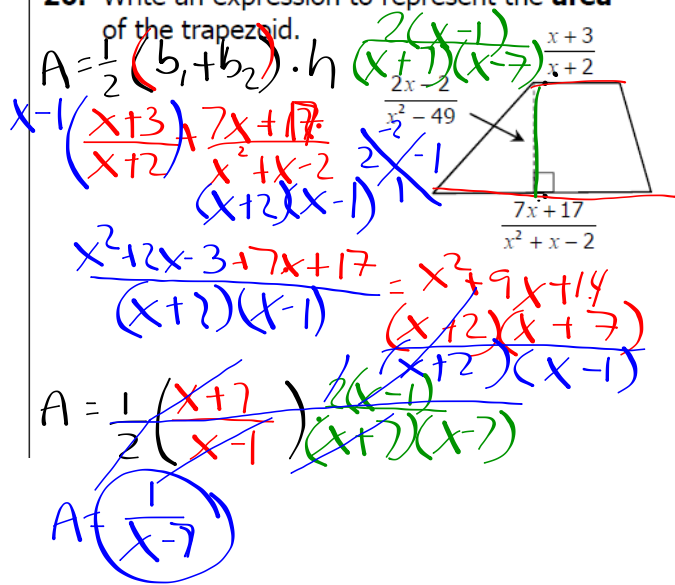
24. Write an expression to represent the **volume** of the rectangular prism.



25. Write an expression to represent the **perimeter** of the rectangle.



26. Write an expression to represent the **area** of the trapezoid.



Unit 10 Test Study Guide

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KEY

Topic 1: Simplifying Rational Expressions**Directions:** Simplify each expression.

1. $\frac{16xy^5}{42x^2y^3} = \frac{8y^2}{21x}$	2. $\frac{r^2+2r}{5r+10} = \frac{r(r+2)}{5(r+2)}$ $= \frac{r}{5}$
3. $\frac{6k^2-11k+4}{9k^2-16} = \frac{(3k-4)(2k-1)}{(3k-4)(3k+4)}$ $= \frac{2k-1}{3k+4}$	4. $\frac{y^3-y}{y^3+8y^2-9y} = \frac{y(y+1)(y-1)}{y(y+9)(y-1)}$ $= \frac{y+1}{y+9}$

Topic 2: Operations with Rational Expressions**Directions:** Perform the indicated operation. Give each answer in simplest form.

5. $\frac{5v^3}{7v^2} \cdot \frac{21v^2}{20v} = \frac{105v^5}{140v^3}$ $= \frac{3v^2}{4}$	6. $\frac{a^2+a-6}{a^2-a-2} \cdot \frac{a^2+5a+4}{a^2+2a-3}$ $= \frac{(a+3)(a-2)}{(a-2)(a+1)} \cdot \frac{(a+4)(a+1)}{(a+3)(a-1)}$ $= \frac{a+4}{a-1}$
7. $\frac{10m+10}{8m^2+12m} \cdot \frac{2m^2+m-3}{m^2-1}$ $= \frac{10(m+1)}{4m(2m+3)} \cdot \frac{(2m+3)(m-1)}{(m+1)(m-1)}$ $= \frac{10}{4m} = \frac{5}{2m}$	8. $\frac{6q^5}{8q^5} \div \frac{9q}{8q^2}$ $= \frac{6q^5}{8q^5} \cdot \frac{8q^2}{9q} = \frac{48q^7}{72q^6}$ $= \frac{2q}{3}$
9. $\frac{c^2-6c+8}{c^2-2c} \div (3c-12)$ $= \frac{(c-4)(c-2)}{c(c-2)} \cdot \frac{1}{3(c-4)} = \frac{1}{3c}$	10. $\frac{p^2-36}{2p^2+3p+1} \div \frac{4p-24}{8p+4}$ $= \frac{(p+6)(p-6)}{(2p+1)(p+1)} \cdot \frac{4(p+1)}{4(p-6)} = \frac{p+6}{p+1}$

<p>11. $\frac{3x+10}{x^2-49} + \frac{x+18}{x^2-49}$</p> $= \frac{4x+28}{x^2-49}$ $= \frac{4(x+7)}{(x+7)(x-7)} = \boxed{\frac{4}{x-7}}$	<p>12. $\frac{n^2+7n}{n^2+4n-32} - \frac{n+16}{n^2+4n-32}$</p> $= \frac{n^2+6n-16}{n^2+4n-32}$ $= \frac{(n+8)(n-2)}{(n+8)(n-4)} = \boxed{\frac{n-2}{n-4}}$
<p>13. $\frac{5}{18z} + \frac{1}{2z} \cdot \frac{9}{9}$</p> $= \frac{5}{18z} + \frac{9}{18z}$ $= \frac{14}{18z} = \boxed{\frac{7}{9z}}$	<p>14. $\frac{6r-2}{10r-20} - \frac{1}{r-2} \cdot \frac{10}{10}$</p> $= \frac{6r-12}{10r-20}$ $= \frac{6(r-2)}{10(r-2)} = \frac{6}{10} = \boxed{\frac{3}{5}}$
<p>15. $\frac{k^2-10k+1}{5k^2-2k-3} + \frac{1}{k-1} \cdot \frac{(5k+3)}{(5k+3)}$</p> $= \frac{k^2-5k+4}{5k^2-2k-3}$ $= \frac{(k-4)(k-1)}{(5k+3)(k-1)} = \boxed{\frac{k-4}{5k+3}}$	<p>16. $\frac{v+1}{v+5} + \frac{5v-11}{v^2+4v-5} \div \frac{v^2-v-12}{v^2+2v-3}$</p> $= \frac{v+1}{v+5} + \frac{5v-11}{(v+5)(v-1)} \cdot \frac{(v+3)(v-1)}{(v-4)(v+3)}$ $\overset{v-1}{\cancel{v-1}} \cdot \frac{v+1}{v+5} + \frac{5v-11}{(v+5)(v-4)}$ $= \frac{v^2-3v-4}{(v-4)(v+5)} + \frac{5v-11}{(v+5)(v-4)}$ $= \frac{v^2+2v-15}{(v-4)(v+5)} = \frac{(v+5)(v-3)}{(v-4)(v+5)} = \boxed{\frac{v-3}{v-4}}$

Topic 3: Rational Equations

Directions: Solve each equation.

17. $\frac{x+2}{6} = \frac{2x-10}{8}$

$$8x+16 = 12x-60$$

$$76 = 4x$$

$$\boxed{x=19}$$

18. $\frac{r+1}{4} = \frac{14}{r}$

$$r^2+r = 56$$

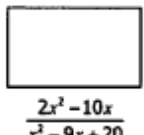
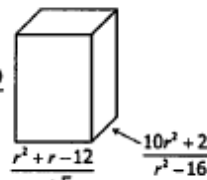

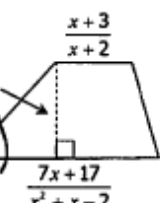
$$r^2+r-56 = 0$$

$$(r+8)(r-7) = 0$$

$$\boxed{r = \{-8, 7\}}$$

<p>19. $\frac{8}{3a} = \frac{a}{6}$</p> $3a^2 = 48$ $3a^2 - 48 = 0$ $3(a^2 - 16) = 0$ $3(a+4)(a-4) = 0$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">$a = \{-4, 4\}$</div>	<p>20. $\frac{w-7}{6} = \frac{4}{w+3}$</p> $w^2 - 4w - 21 = 24$ $w^2 - 4w - 45 = 0$ $(w+5)(w-9) = 0$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">$w = \{-5, 9\}$</div>
<p>21. $\frac{4}{c-3} \cdot \frac{2}{4c-12} = \frac{1}{c-5}$</p> $\frac{7}{4c-12} = \frac{2}{c-5}$ $8c - 24 = 7c - 35$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">$c = -11$</div>	<p>22. $\frac{7}{12y} - \frac{1}{6y} = \frac{y-1}{y+1}$</p> $\frac{5}{12y} = \frac{y-1}{y+1}$ $12y^2 - 12y = 5y + 5$ $12y^2 - 17y - 5 = 0$ $(4y+1)(3y-5) = 0$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">$y = \{-\frac{1}{4}, \frac{5}{3}\}$</div>

Topic 4: Applications with Rational Expressions

<p>23. Write an expression to represent the area of the rectangle.</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> $\frac{(x-4)(x-4)}{4x^2} \cdot \frac{2x(x-5) \frac{x^2-8x+16}{4x^2}}{(x-5)(x-4)}$ $= \frac{2x(x-4)}{4x^2}$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">$\frac{x-4}{2x}$</div> </div>  </div>	<p>24. Write an expression to represent the volume of the rectangular prism.</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> $\frac{3r^2+3r-60}{5r^2+r}$ </div>  </div> $\frac{3(r+5)(r-4)}{r(5r+1)} \cdot \frac{(r+4)(r-3)}{r+5} \cdot \frac{2r(5r+1)}{(r+4)(r-4)}$ $= \frac{6r(r-3)}{r} = \boxed{6(r-3)}$
<p>25. Write an expression to represent the perimeter of the rectangle.</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> $\frac{k^2-10}{k+4} + \frac{6k+2}{k+4}$ $= \frac{2k^2+6k-8}{k+4}$ $= \frac{2(k+4)(k-1)}{k+4} = \boxed{2(k-1)}$ </div>  </div>	<p>26. Write an expression to represent the area of the trapezoid.</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> $\frac{1}{2} \cdot \frac{2x-2}{x^2-49} \cdot \left(\frac{7x+17}{x^2+x-2} + \frac{x+3}{x+2} \cdot \frac{x-1}{x-1} \right)$ $= \frac{1}{2} \cdot \frac{2x-2}{x^2-49} \cdot \frac{x^2+9x+14}{x^2+x-2}$ $= \frac{1}{2} \cdot \frac{2(x-1)}{(x+7)(x-7)} \cdot \frac{(x+7)(x+2)}{(x+2)(x-1)} = \boxed{\frac{1}{x-7}}$ </div>  </div>