HONORS GEOMETRY—Summer Skills Set

Algebra Concepts **Adding and Subtracting Rational Numbers**

Helpful Hint

To add or subtract fractions with the same denominator, add or subtract the numerators and write the sum or difference over the denominator. Simplify, if necessary.

Example: $\frac{3}{5}+\frac{1}{5}=\frac{3+1}{5}=\frac{4}{5}$ **Example:** $\frac{7}{16}-\frac{3}{16}=\frac{7-3}{16}=\frac{4}{16}=\frac{1}{4}$

To add or subtract fractions with different denominators, first find the least common denominator (LCD). Rewrite each fraction with the LCD, and then add or subtract. Simplify, if necessary.

Example: $\frac{1}{2}+\frac{2}{3}=\frac{3}{6}+\frac{4}{6}=\frac{7}{6}$ (improper fraction) or $1\frac{1}{6}$ (mixed number)

Find each sum or difference. Write in simplest form.

1. $\frac{5}{16}-\frac{4}{16}$
2. $\frac{2}{15}+\frac{7}{15}$
3. $\frac{2}{3}+\frac{1}{3}$
4. $\frac{5}{4}-\frac{3}{4}$
5. $\frac{1}{2}-\frac{1}{3}$
6. $\frac{8}{9}-\frac{2}{3}$
7. $\frac{3}{7}+\frac{5}{14}$
8. $\frac{11}{12}-\frac{4}{15}$
9. $\frac{2}{5}+\frac{3}{4}$
10. $1-\frac{1}{19}$
11. $\frac{9}{10}-\left(-\frac{3}{5}\right)$
12. $-\frac{2}{3}+\frac{5}{9}$
13. $\left(\frac{3}{4}\right)-\left(\frac{2}{7}\right)$
14. $\left(-\frac{4}{5}\right)-\left(\frac{1}{4}\right)$
15. $\left(-\frac{2}{5}\right)-\left(-\frac{1}{3}\right)$

1.	$\frac{1}{16}$
2.	$\frac{3}{5}$
3.	1
4.	$\frac{1}{2}$
5.	$\frac{1}{6}$
6.	$\frac{2}{9}$
7.	$\frac{11}{14}$
8.	$\frac{13}{20}$
9.	$\frac{23}{20}$ or $1\frac{3}{20}$
10.	$\frac{18}{19}$
11.	$\frac{3}{2}$ or $1\frac{1}{2}$
12.	$-\frac{1}{9}$
13.	$\frac{13}{28}$
14.	$-\frac{21}{20}$ or $-1\frac{1}{20}$
15.	$-\frac{1}{15}$
Score	

Helpful Hints		Examples:		
	1. Evaluate within grouping symbols 2. Evaluate powers (exponents) 3. Multiply and divide in order (L→R) 4. Add and subtract in order (L→R) 5. Simplify as needed * A number next to a grouping symbol means multiply.		$3^2(5-3)^3+3$ $=3^2(2)^3+3$ $=9(8)+3$ $=72+3$ $=75$	$4+12\times3-8\div4$ $=4+36-2$ $=40-2$ $=38$

Evaluate each expression.

1. $6-5(7-5)^3+5$
2. $(4+5)-8+2(3)$
3. $(6-3)^2+12-8\div2$
4. $36\div2(5-1)^2$
5. $-4+5(7-4)-(-3)\div3$
6. $-7(8)+4(2)-(6+1)^2$

Evaluate each expression for $s=-3$ and $v=2$

7. sv^2
8. $(sv)^2$
9. $-s^2+2s-4$
10. s^2-v^2
11. $(s-v)^2$
12. $2s^2v$

1.	-29
2.	7
3.	17
4.	288
5.	12
6.	-97
7.	-12
8.	36
9.	-19
10.	5
11.	25
12.	36
Score	

Helpful Hints	
	• Factor out the greatest common factor (GCF) first • Look for special cases next—the difference of two squares (two terms only) or a perfect square trinomial (three terms) • Look for a pair of binomial factors ("reverse-FOIL") • If there are four or more terms, try grouping to find common binomial factors • As a final check, be sure there are no common factors other than 1

Factor completely.

1. $x^2 + 9x + 18$
2. $x^2 - 6x + 9$
3. $x^2 - 5x - 24$
4. $x^2 + 3x - 70$
5. $18x^2 + 57x + 24$
6. $x^4 - 10x^2 + 9$
7. $-2p^2 + 28p - 66$
8. $16y^2 - 1$
9. $2x^2 - 9x - 5$
10. $10x^2 - 9x + 2$
11. $20q^2 - 13q + 2$
12. $x^4 - x^2$
13. $12p^3 - 21p^2 + 28p - 49$
14. $6v^3 + 16v^2 + 21v + 56$

1.	$(x+3)(x+6)$
2.	$(x-3)^2$
3.	$(x-8)(x+3)$
4.	$(x+10)(x-7)$
5.	$3(2x+1)(3x+8)$
6.	$(x-1)(x+1)(x-3)(x+3)$
7.	$-2(p-11)(p-3)$
8.	$(4y-1)(4y+1)$
9.	$(2x+1)(x-5)$
10.	$(2x-1)(5x-2)$
11.	$(4q-1)(5q-2)$
12.	$x^2(x+1)(x-1)$
13.	$(3p^2+7)(4p-7)$
14	$(2v^2+7)(3v+8)$
Score	

Helpful Hints

The solutions of a quadratic equation are the x-intercepts of the graph of the corresponding parabola. There can be two real solutions, one real solution, or no real solution.

- First bring everything to one side (set the equation equal to 0).
- When there is no linear term (b = 0), get x^2 by itself and take the square root. Two answers result.
- If the quadratic expression can be factored easily, then factor, set each factor equal to zero and solve.
- When factoring is not easy or not possible, use the quadratic formula or solve by calculating the zeros on your graphing calculator.

The quadratic formula: If $ax^2 + bx + c = 0$, then $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Solve each equation by the indicated method. When necessary, round answers to two decimal places.

Solve questions 1-3 by using square roots.

1. $k^2 = 16$
2. $x^2 + 7 = 25$
3. $2m^2 + 24 = 10$

Solve questions 4-6 by factoring.

4. $p^2 + 3p - 18 = 0$
5. $n^2 + 8n = -15$
6. $7r^2 - 14r = -7$

Solve questions 7-9 by using the quadratic formula. Check your answers by graphing.

7. $4g^2 + 8g + 7 = 4$
8. $5x^2 = 18$
9. $9n^2 - 7n - 4 = 0$

Solve questions 10-12 by an appropriate method.

10. $x^2 + 2x - 1 = 2$
11. $8x^2 + 4x - 16 = -x^2$
12. $10x^2 + 2 = 292$

1.	$k = \pm 4$
2.	$x \approx \pm 4.24$
3.	no solution
4.	$p = -6, 3$
5.	$n = -5, -3$
6.	$r = 1$
7.	$g = -\frac{3}{2}$ or $-\frac{1}{2}$
8.	$x = \pm 1.90$
9.	$n \approx -0.38$ or 1.16
10.	$x = -3, 1$
11.	$x \approx -1.57$ or 1.13
12.	$x \approx \pm 5.39$
Score	

Helpful Hints

To solve an equation in one variable, use inverse operations to isolate the variable.

Example: $5-2(r+6)=1$

$5-2r-12=1$	Distributive Property
$-2r-7=1$	Combine like terms
$-2r-7+7=1+7$	Add 7 to each side
$-2r=8$	Simplify
$\frac{-2r}{-2}=\frac{8}{-2}$	Divide both sides by -2
$r=-4$	Simplify

Solve each equation.

1. $x-6=10$
2. $\frac{x}{5}=15$
3. $8x=24$
4. $-\frac{4}{7}x=-8$
5. $a-\frac{1}{8}=\frac{5}{8}$
6. $3y-4=20$
7. $\frac{t}{7}+2=1$
8. $3r-(2r+1)=21$
9. $44=5y-8-y$
10. $75+7c=2c$
11. $\frac{3}{5}n+12=2n-9$
12. $-\frac{1}{2}(16-2y)=11$
13. $7(4c+1)-2(2c-3)=-23$
14. $x-(-4x+2)=13$

1.	$x=16$
2.	$x=75$
3.	$x=3$
4.	$x=14$
5.	$a=\frac{3}{4}$
6.	$y=8$
7.	$t=-7$
8.	$r=22$
9.	$y=13$
10.	$c=-15$
11.	$n=15$
12.	$y=19$
13.	$c=-\frac{3}{2}$
14.	$x=3$
Score	

Helpful Hints

To solve a system of equations use the substitution method.

Example: Solve the linear system.

$$x + y = 1 \qquad \text{Equation 1}$$
$$2x - 3y = 12 \qquad \text{Equation 2}$$

SOLUTION

Solve for y in Equation 1.

$y = -x + 1$ Revised Equation 1

Substitute $-x + 1$ for y in Equation 2 and solve for x.

$2x - 3y = 12$	Write Equation 2.
$2x - 3(-x + 1) = 12$	Substitute $-x + 1$ for y.
$2x + 3x - 3 = 12$	Distribute the -3.
$5x - 3 = 12$	Simplify.
$5x = 15$	Add 3 to each side.
$x = 3$	Solve for x.

To find the value of y, substitute 3 for x in the revised Equation 1.

$y = -x + 1$	Write revised Equation 1.
$y = -3 + 1$	Substitute 3 for x.
$y = -2$	Solve for y.

The solution is $(3, -2)$.

1. $4x + y = 9$
$y = -7$

2. $3x = 9$
$-2x + y = -8$

3. $x - 2y = -13$
$y = -2x - 6$

4. $x - y = 10$
$5x - y = -6$

5. $4x + y = 2$
$x - y = -17$

6. $-x + 3y = 4$
$x + 6y = 14$

7. $3x + 2y = 8$
$x + 4y = -4$

8. $x - 5y = -3$
$4x - 3y = 5$

9. $2x + 5y = 4$
$x + 5y = 7$

1.	(4, -7)
2.	(3, -2)
3.	(-5, 4)
4.	(-4, -14)
5.	(-3, 14)
6.	(2, 2)
7.	(4, -2)
8.	(2, 1)
9.	(-3, 2)
Score	

Helpful Hints

To solve a system of equations using linear combinations.

Example:

Solve the linear system. $4x - 3y = 11$ Equation 1

$3x + 2y = -13$ Equation 2

Solution

The equations are arranged with like terms in columns. You can get the coefficients of y to be opposites by multiplying the first equation by 2 and the second equation by 3.

$4x - 3y = 11$	Multiply by 2.	$8x - 6y = 22$
$3x + 2y = -13$	Multiply by 3.	$\underline{9x + 6y = -39}$

$17x = -17$ Add the equations.

$x = -1$ Solve for x.

Substitute -1 for x in the second equation and solve for y.

$3x + 2y = -13$	Write Equation 2.
$3(-1) + 2y = -13$	Substitute -1 for x.
$-3 + 2y = -13$	Simplify.
$y = -5$	Solve for y.

The solution is $(-1, -5)$.

1. $x + y = 11$
$x - y = 7$

2. $x - 2y = 8$
$-x + 3y = -15$

3. $3x + y = -8$
$-3x + 4y = -2$

4. $4x - 5y = -18$
$5x + 4y = -2$

5. $2x + 5y = -22$
$4x - 3y = 8$

6. $4x = -3 + y$
$y = -6x - 7$

7. $x + 2y = -3$
$x - 4y = 15$

8. $-x - 5y = 30$
$2x - 7y = 25$

9. $-x + 8y = 16$
$3x + 4y = 36$

1.	(9, 2)
2.	(-6, -7)
3.	(-2, -2)
4.	(-2, 2)
5.	(-1, -4)
6.	(-1, -1)
7.	(3, -3)
8.	(-5, -5)
9.	(8, 3)
Score	

Example:
Write an equation of the line that passes through the point $(-2, 5)$ and has a slope of 3.

SOLUTION

Find the y-intercept.

$y = mx + b$	Write slope-intercept form.
$5 = 3(-2) + b$	Substitute 3 for m, -2 for x, and 5 for y.
$5 = -6 + b$	Simplify.
$11 = b$	Solve for b.

The y-intercept is $b = 11$.

Now write an equation of the line, using slope-intercept form.

$y = mx + b$	Write slope-intercept form.
$y = 3x + 11$	Substitute 3 for m and 11 for b.

Write an equation of the line that passes through the point and has the given slope. Write the equation in slope-intercept form.

1. $(3, 5)$, $m = -1$ **2.** $(-2, 6)$, $m = 4$ **3.** $(7, -2)$, $m = -3$

4. $(2, 8)$, $m = 0$ **5.** $(-3, 0)$, $m = 2$ **6.** $(0, 0)$, $m = -7$

7. $(0, -2)$, $m = -\frac{5}{3}$ **8.** $(-5, -1)$, $m = \frac{3}{4}$ **9.** $(3, -2)$, $m = -\frac{5}{7}$

1. $y = -x + 8$
2. $y = 4x + 14$
3. $y = -3x + 27$
4. $y = 8$
5. $y = 2x + 6$
6. $y = -7x$
7. $y = -\frac{5}{3}x - 2$
8. $y = \frac{3}{4}x + \frac{11}{4}$
9. $y = -\frac{5}{7}x + \frac{1}{7}$
Score

Example:

Write an equation of the line that passes through the points (1, 5) and (2, 3).

SOLUTION

Find the slope of the line. Let $(x_1, y_1) = (1, 5)$ and $(x_2, y_2) = (2, 3)$.

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$	Write formula for slope.
$= \dfrac{3 - 5}{2 - 1}$	Substitute.
$= \dfrac{-2}{1} = -2$	Simplify.

Find the y-intercept. Let $m = -2$, $x = 1$, and $y = 5$ and solve for b.

$y = mx + b$	Write slope-intercept form.
$5 = (-2)(1) + b$	Substitute -2 for m, 1 for x, and 5 for y.
$5 = -2 + b$	Simplify.
$7 = b$	Solve for b.

Write an equation of the line.

$y = mx + b$	Write slope-intercept form.
$y = -2x + 7$	Substitute -2 for m and 7 for b.

Write an equation in slope-intercept form of the line that passes through the points.

1. (5, 0), (−10, −5)

2. (1, 1), (3, 3)

3. (1, −7), (3, −15)

4. (−6, −2), (−10, −14)

5. (2, 3), (6, 11)

6. (0, 2), (−2, 0)

7. (0, 0), (3, −6)

8. (0, 4), (−1, 3)

9. (−5, 9), (−2, 0)

1. $y = \frac{1}{3}x + \frac{5}{3}$
2. $y = x$
3. $y = -4x - 3$
4. $y = 3x + 16$
5. $y = 2x - 1$
6. $y = x + 2$
7. $y = -2x$
8. $y = x + 4$
9. $y = -3x - 6$
Score

Helpful Hints

To simplify radicals, look for perfect squares that divide evenly into the radicand.
Perfect squares: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, et cetera…

Example: $\sqrt{56}=\sqrt{4\bullet 14}=\sqrt{4}\bullet\sqrt{14}=2\sqrt{14}$

Use the product or quotient rule to simplify radicals. Multiply rational parts separately.

Example: $2\sqrt{7}\bullet 3\sqrt{14}=2\bullet 3\sqrt{7\bullet 14}=6\sqrt{7\bullet 7\bullet 2}=6\sqrt{7^2}\bullet\sqrt{2}=6\bullet 7\sqrt{2}=42\sqrt{2}$

Example: $\dfrac{\sqrt{6z^2w}}{\sqrt{2zw}}=\sqrt{\dfrac{6z^2w}{2zw}}=\sqrt{\dfrac{^{3}\cancel{6}z^{\cancel{2}}\cancel{w}}{_{1}\cancel{2}\cancel{z}\cancel{w}}}=\sqrt{3z}$

To add or subtract radicals, the radicand must be the same. Simplify individual radicals first.

Example: $\sqrt{18}-\sqrt{8}+\sqrt{44}=3\sqrt{2}-2\sqrt{2}+2\sqrt{11}=\sqrt{2}+2\sqrt{11}$

Simplify each expression. Write in simplest radical form.

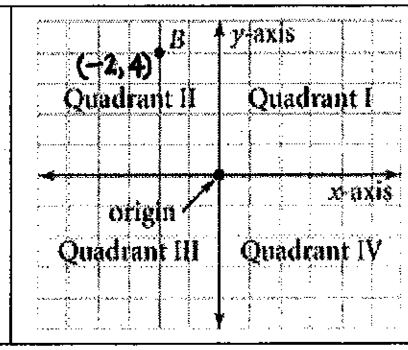
1. $\sqrt{45}$
2. $\sqrt{216}$
3. $5\sqrt{128}$
4. $\sqrt{5}\bullet\sqrt{10}$
5. $3\sqrt{12}\bullet\sqrt{6}$
6. $\dfrac{\sqrt{72}}{\sqrt{8}}$
7. $\sqrt{\dfrac{16}{81}}$
8. $\dfrac{3\sqrt{20}}{2\sqrt{4}}$
9. $-3\sqrt{7}+5\sqrt{7}$
10. $10\sqrt{15}-9\sqrt{15}$
11. $-11\sqrt{21}-11\sqrt{21}$
12. $-2\sqrt{3}+3\sqrt{27}$
13. $2\sqrt{6}-2\sqrt{24}$
14. $2\sqrt{45}-2\sqrt{5}+\sqrt{20}$

1.	$3\sqrt{5}$
2.	$6\sqrt{6}$
3.	$40\sqrt{2}$
4.	$5\sqrt{2}$
5.	$18\sqrt{2}$
6.	3
7.	$\frac{4}{9}$
8.	$\frac{3\sqrt{5}}{2}$
9.	$2\sqrt{7}$
10.	$\sqrt{15}$
11.	$-22\sqrt{21}$
12.	$7\sqrt{3}$
13.	$-2\sqrt{6}$
14.	$6\sqrt{5}$
Score	

Ordered pairs can be graphed on a coordinate plane.
The first number of an ordered pair shows how to move *across*. It is called the **x-coordinate.**

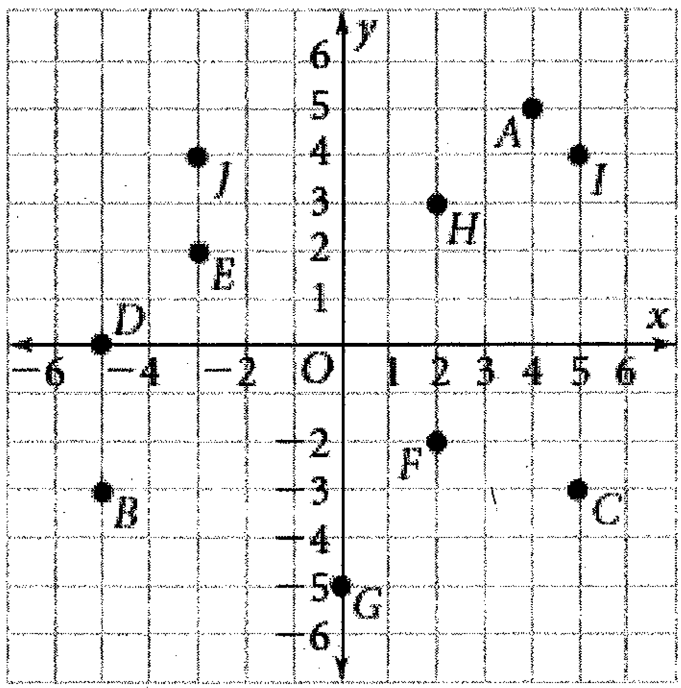
The second number of an ordered pair shows how to move *up or down*. It is called the **y-coordinate**.

Example:
To locate point *B*, move left (backward) to −2 and up to 4.



Give the coordinates of the following labeled points.

1. A
2. B
3. C
4. D
5. E



Match the coordinates to the corresponding point labeled on the above graph.

6. (−3, 4)
7. (5, 4)
8. (0, −5)
9. (2, 3)
10. (2, −2)

1.	(4, 5)
2.	(−4, −3)
3.	(5, −3)
4.	(−4, 0)
5.	(−3, 2)
6.	J
7.	I
8.	G
9.	H
10.	F
Score	