

June 2011

Dear Parent and Student:

Providence High School's high quality of academic instruction provides great opportunities for success for our students. To that end, faculty strongly supports the idea of keeping a young mind busy with great ideas and curious learning, an ongoing process which translates later into success along with peace of mind of having accomplished your goal of sending your child or coming to Providence.

The purpose and benefit of the summer assignment is multifold. First, it allows the student to review previously known or familiar material in preparation for the fall semester. This directly translates into a better understanding of the new concepts being introduced by the teacher in the classroom. Setting the groundwork for this type of comfort in understanding is one of the primary reasons. Second, the academic performance challenges students to move to a higher learning curve and not just remain at average levels, an idea that I'm sure we all agree to be a win-win-win (parent-student-teacher) situation. Third, it allows students to enroll in higher level upper-division courses as they journey their four years of high school at PHS.

We have a responsibility to help you believe in this project with just one goal in mind- the personal and academic success of the student. This, along with the confidence to handle challenging, college-prep material is what we are all about, a college-prep school.

We hope you will support us in this assignment. The proof may not be visible today or tomorrow, but we can assure you that it is a project worth undertaking.

Thank you and have a great summer. Please access all information including "packet" content on the school's public website at [www.providencehigh.org](http://www.providencehigh.org) or on the Math Department page of the school portal by clicking in the Quick Launch Bar on "Summer Assignments"

You Belong Here.

## **Algebra Concepts and Applications**

**Summer Math Skills, 2011 (HONS)**

Name: \_\_\_\_\_

This summer Math skills packet has been prepared for you to refresh your Algebra Concepts and Applications. Work through every problem and use the blank space and blank pages to show your work, use additional pages if necessary.

**Simplify.** Assume that variable exponents represent positive integers.

1.  $3z^2 \cdot 2z^3$

3.  $(-t^4)^3$

5.  $(3x^2y)(xy^2)$

7.  $(-2u^2)(uv^3)(-u^2v^2)$

9.  $(4a^3b^2)^2$

11.  $(-3pq^4r^2)^3$

13.  $(-z^3)(-z)^3$

15.  $(s^2t)^3(st^3)^2$

17.  $3y(x^3 - 2y^2 + 3)$

19.  $rs^2(r^2 - 2rs - s^2)$

21.  $z^{n-2} \cdot z^{n+2}$

23.  $x^{m-n} + x^1 \cdot x^m$

25.  $r^{h-2}(r^{h+1})^2$

27.  $i(t^{n-1} + t^n + t^{n+1})$

29.  $p^n(p^{m-n+1} + p^{m-n})$

31.  $z^{m-n}(z^{n+m} - z^{n-m} + z^n)$

33.  $(t^m)^n(t^n)^{n-m}$

**In Exercises 35–38, solve for  $n$ .**

35.  $3^{5n} = 3^5(3^{2n})^2$

37.  $3 \cdot 9^{2n} = (3^{n+1})^3$

2.  $5r^2 \cdot r^4$

4.  $(-t^3)^4$

6.  $(4p^2q)(p^2q^3)$

8.  $(r^2s)(-3rs^3)(2rs)$

10.  $(2c^2d^3)^3$

12.  $(-x^2yz^3)^4$

14.  $(-c)^2(-c^4)$

16.  $(2x^2y^3)^3(3x^3y)^2$

18.  $x^2(x - 2x^2 + 3x^3)$

20.  $p^2q^3(p^2 - 4q)$

22.  $t^4 \cdot t^{k-4}$

24.  $y^{p+2} \cdot y^p \cdot y^{p-2}$

26.  $s^3(s^{2k-1})^3$

28.  $x^2(x^k - x^{k-1} + x^{k-2})$

30.  $s^{2n}(s^{2m-n} - s^{m-2n})$

32.  $x^{h+k}(x^{2h-k} - x^{h-2k} + x^k)$

34.  $(y^{h-k})^h(y^{h+k})^k$

36.  $(2^{3n})^2 = (2^n)^3 \cdot 2^{n+6}$

38.  $4^{n+3} \cdot 16^n = 8^{3n}$

State whether or not each polynomial is prime.

9.  $4x + 9$

10.  $x^2 + 3x$

11.  $x^2 - 2x + 1$

12.  $x^2 + 1$

13.  $x^4 + x^2$

14.  $x^3 + 4$

15. One factor of  $x^2 + 3x - 10$  is  $x - 2$ . What is the other?

16. One factor of  $2x^2 + 5x - 12$  is  $x + 4$ . What is the other?

Factor completely. If the polynomial is prime, say so.

1.  $x^2 - 9x + 8$

2.  $t^2 + 9t + 14$

3.  $z^2 - 11z + 18$

4.  $u^2 - 10u + 9$

5.  $r^2 + 12r + 20$

6.  $y^2 - 5y + 6$

7.  $p^2 - 8p + 9$

8.  $h^2 - 10h + 24$

9.  $s^2 - 20s + 36$

10.  $z^2 - 9z + 12$

11.  $x^2 + x - 12$

12.  $t^2 + 2t - 15$

13.  $t^2 - 2t - 35$

14.  $s^2 - 6s - 27$

15.  $3z^2 + 4z + 1$

16.  $5v^2 + 4v - 1$

17.  $8 + 2s - s^2$

18.  $21 - 4x - x^2$

19.  $x^2 - xy - 30y^2$

20.  $p^2 + 2pq - 24q^2$

21.  $u^2 - 8uv - 12v^2$

22.  $h^2 - 8hk - 15k^2$

23.  $2t^2 + 5t - 3$

24.  $3x^2 - 8x + 5$

25.  $3p^2 - 7p - 6$

26.  $4r^2 + 8r + 3$

27.  $6x^2 - 7xy - 3y^2$

28.  $6s^2 + st - 5t^2$

29.  $7h^2 + 7hk - 15k^2$

30.  $2u^2 + uv - 21v^2$

Evaluate each expression for the given values of the variable.

25.  $\frac{y(y-3)}{y-2}$

a.  $y = 1$

b.  $y = 4$

c.  $y = 3$

26.  $\frac{(x^2-4)(x-3)}{x+1}$

a.  $x = 1$

b.  $x = 2$

c.  $x = -2$

27.  $\frac{(t-1)(t+1)(t-3)}{\frac{1}{2}t+2}$

a.  $t = 2$

b.  $t = 0$

c.  $t = -2$

28.  $\frac{(r-3)(r)(r+3)}{(r-2)(r+2)}$

a.  $r = \frac{1}{2}$

b.  $r = -1$

c.  $r = 0$

Find the prime factorization of each integer.

1. 140

2. 198

3. 89

4. 756

5. 441

6. 203

7. 2548

8. 3861

Find (a) the GCF and (b) the LCM of the following monomials.

9. 20, 35

10. 45, 75

11. -48, 108

12. 315, -525

13. 84, -56, 140

14. 168, 280, 196

15. 3, 5, 7, 9

16. 30, 35, 36, 42

17.  $9p^3q$ ,  $15p^2$

18.  $49x^3$ ,  $35x^2y$

19.  $68xy^2z$ ,  $51y^2z^2$

20.  $52x^2s$ ,  $78rs^2t$

21.  $110h^3k^2r$ ,  $-88h^2k^2r^2$

22.  $98a^3b^2c$ ,  $-70abc^2$

23.  $14ab$ ,  $14bc$ ,  $21ac$

24.  $22xy^2z^2$ ,  $33x^2yz^2$ ,  $44x^2yz$

25.  $26p^3q^2r^2$ ,  $39p^2q^3r^2$ ,  $78p^2q^2r^3$

26.  $200a^3b^2c$ ,  $300a^2bc^3$ ,  $400ab^3c^2$

Factor each polynomial.

1.  $16x^3 - 64x^2$

2.  $6x^2y^2 + 8x^3y$

3.  $t^2 + 18t + 81$

4.  $z^2 - 12z + 36$

5.  $16k^2 - 1$

6.  $121x^2 - 1$

7.  $4y^2 + 20y + 25$

8.  $9s^2 - 24s + 16$

9.  $16x^2 - 25$

10.  $4h^2 - 81$

11.  $121s^2 - 66st + 9t^2$

12.  $16x^2 + 40xy + 25y^2$

13.  $36p^2 - 49q^2$

14.  $9x^4 - 16z^2$

15.  $st^2 - s$

16.  $p^3q - pq$

17.  $t^3 - 27$

18.  $8p^3 + 1$

**Simplify.**

15.  $6 - [7 - (5 - 2)]$

17.  $\frac{2^3 + 1}{2^2 - 1}$

19.  $\frac{1}{3} \left| \frac{1 + 7^2}{5^2} \right|$

21.  $64 \div 4^2 + 3(3^2 - 1)$

23.  $[3^3 - (2^3 + 2^2)] \div 5$

16.  $14 - 2[9 - 2(5 - 3)]$

18.  $\frac{3^2}{5 - (3 - 1)}$

20.  $\frac{2^2(3^2 + 4^2)}{10^2}$

22.  $2^2 \cdot 3^2 - (5^2 - 4^2)$

24.  $\frac{1}{10} [2(3 + 4) - 3^2]$

**Evaluate each expression if  $x = 3$ ,  $y = 2$ , and  $z = 5$ .**

25.  $2x^2 + x - 2$

27.  $(yz - x)^3$

29.  $\frac{4x^3}{x^2 - y^2}$

31.  $\frac{x + z}{y} - \frac{x + y}{2z}$

33.  $\left( \frac{xyz}{x - y + z} \right)^4$

35.  $\frac{z^2 - (x^2 - y^2)}{3y^2z}$

26.  $3y^2 - y - 5$

28.  $(xz - zy)^3$

30.  $\frac{4xyz}{z^2 - x^2}$

32.  $\frac{z^2}{x + y} - \frac{y^2}{z - x}$

34.  $\left( \frac{z^2 - y^2 - x^2}{xy} \right)^5$

36.  $\frac{z^2 - y^2}{xz - 2y(z - x)}$

**Simplify.**

1.  $96 + 13 + 4 + 37$

3.  $\frac{1}{3}(1 \cdot 3) + (-1)$

5.  $4\left(z + \frac{1}{4}\right)$

7.  $1 \cdot (-t + t)$

9.  $2(a + 4) + (-8)$

2.  $-6 + x + 6$

4.  $\frac{1}{3}(1 \cdot 3) + (-3 + 3)$

6.  $\frac{1}{4}(z + 4)$

8.  $\left(\frac{2}{3}a\right)\left(\frac{3}{2}b\right)$

10.  $\left(\frac{1}{3} \cdot 3\right)[p + (-1)] + 1$

Find (a) the GCF and (b) the LCM of the following.

3.  $36a^2b^3, 54abc^2$

4.  $6p^3q^2r, 8p^2q^2r^2, 4p^3q^3$

Factor completely.

5.  $27x^3 - 12x$

6.  $9t^2 + 6t + 1$

7.  $125s^3 - 8t^3$

8.  $ab - a + b - 1$

9.  $6t^2 + 4t - 2$

10.  $4z^2 + z - 14$

Simplify. You may wish to check your answers on a calculator.

4.  $64 \div [(-4) \div (-2)]$

5.  $-6 \div \left(-\frac{1}{3}\right) \div (-1)$

6.  $-\frac{1}{2} \div \left(\frac{1}{4}\right) \div (-4)$

7.  $\frac{8(-18)}{3(-12)}$

8.  $\frac{(-3)(-4)(-2)}{(-6)(-2)}$

9.  $[60 \div (-5)][8 \div (-2)]$

10.  $[27(-2)] \div (-3)^4$

11.  $\frac{-16 \cdot 3 \div 2}{(-2)^4}$

12.  $\frac{24 \div (-3)}{4(-5) \div 2}$

13.  $\frac{3^2 - 5^2}{3 + (-5)}$

14.  $\frac{4^2 - 5^2}{(-4) + (-5)}$

15.  $\frac{144 \div (-24)}{(-10) \div \left(-\frac{2}{3}\right)}$

Factor each polynomial.

3.  $x^2 + 3x + 2$

5.  $u^2 + 7u - 8$

7.  $z^2 + z - 12$

4.  $t^2 + 11t + 10$

6.  $y^2 + 4y - 5$

8.  $r^2 - r - 2$

Simplify. You may wish to check your answers on a calculator.

1.  $5(-2)(-7)(-3)$

2.  $7(-2)(6)(-1)$

3.  $9\left(-\frac{1}{7}\right)\left(\frac{1}{3}\right)(-28)$

4.  $\left(\frac{3}{4}\right)(-10)(-8)\left(\frac{1}{5}\right)$

5.  $(0.5)(-6)(-4)(-0.2)$

6.  $(1.5)(-3)(0.2)(-2)(-1)$

7.  $2(-5x)(-6y)$

8.  $(-3)(-u)(-7v)$

9.  $(-a)(-2b)(-3c)$

10.  $\left(-\frac{1}{2}\right)(4r)(-s)$

11.  $(-6 - 4)(-6 + 5)$

12.  $17(-13) + 17(-7)$

13.  $12(-1)^7(-2)^3$

14.  $(-5)^3\left(-\frac{1}{5}\right)^2$

15.  $(-1)^3(-2 - 2)(-6)(-4)$

16.  $(-9)^2(-2 + 2)(-5)$

17.  $(-2)(1 - 2x - 3x^2)$

18.  $(-3)\left(2a - \frac{2}{3}\right)$

Simplify.

1.  $(3x^2 - 7x + 9) - (x^2 + 4x - 1)$

2.  $(a^2b^3)^3$

3.  $(4m^2n)(-3mn^3)$

4.  $5(2y - 1) - 3(y + 2)$

5.  $2c(d - 3) + 3d(c + 4)$

6.  $4p(2p^2 - p + 5)$

7.  $(-u^2)^4(-u)^3$

8.  $(9z^3 - 4z) + (5z^2 - 8)$

9.  $(y^2 - 5y + 9) - (9 + 5y + y^2)$

10.  $\left(-\frac{1}{2}x^2\right)(-4x^4)$

**Multiply.**

- |                        |                        |                        |
|------------------------|------------------------|------------------------|
| 1. $(3v + 1)(2v - 5)$  | 2. $(2x - 3)(3x + 2)$  | 3. $(4z + 3)(3z - 4)$  |
| 4. $(r - 4)(3r - 2)$   | 5. $(3x + 10)^2$       | 6. $(4k - 5)^2$        |
| 7. $(5y - 2)(5y + 2)$  | 8. $(2s + 7)(2s - 7)$  | 9. $(7t + 2)(2t - 1)$  |
| 10. $(5z + 6)(6z - 5)$ | 11. $(9t + 1)(1 - 9t)$ | 12. $(9 - 5t)(5t - 9)$ |

**Multiply. Assume that variable exponents represent positive integers.**

- |  |  |
|--|--|
| 13. $(x - 2y)(3x + 4y)$                | 14. $(5h - 3k)(h - 2k)$                |
| 15. $(2p + 3q)(3p - 2q)$               | 16. $(10r - 3s)(r + 2s)$               |
| 17. $(x^2 - 3)(x^2 + 3)$               | 18. $(p^2 - 2q^2)(p^2 + 2q^2)$         |
| 19. $(s^3 + t^3)^2$                    | 20. $(2z^2 - 5)^2$                     |
| 21. $t(t - 2)(t + 1)$                  | 22. $x^2(x - 3)(x + 3)$                |
| 23. $xy(x - y)^2$                      | 24. $mn(m - n)(m - 2n)$                |
| 25. $(2c + 1)(c^2 - 3c + 2)$           | 26. $(t - 3)(2t^2 - t + 2)$            |
| 27. $(x^2 + 3x - 5)(x + 2)$            | 28. $(x^2 - 2z + 4)(z + 3)$            |
| 29. $(y^4 - 3y^2 + 1)(y^2 - 2)$        | 30. $(3 - k^2)(2 - k^2 - k^4)$         |
| 31. $(x^2 - x + 2)(x^2 + x - 1)$       | 32. $(y^2 - 2y + 1)(y^2 + y + 1)$      |
| 33. $(a + 2b)(a^3 - 2a^2b - b^3)$      | 34. $(3s + 2t)(s^3 - 3st^2 + 2t^3)$    |
| 35. $(p^n - 1)^2$                      | 36. $(x^{2n} - y^n)^2$                 |
| 37. $(r^n - s^n)(r^n + 2s^n)$          | 38. $(x^n + 1)(x^n - 1)$               |
| 39. $(a - b)^3$                        | 40. $(a + b)^3$                        |
| 41. $(a + b)(a^2 - ab + b^2)$          | 42. $(a - b)(a^2 + ab + b^2)$          |
| 43. $(a - b)(a^3 + a^2b + ab^2 + b^3)$ | 44. $(a + b)(a^3 - a^2b + ab^2 - b^3)$ |
| 45. $(x + y)(x - y)(x^2 + y^2)$        | 46. $(x + y)^2(x - y)^2$               |
| 47. $(x^2 + 2x + 2)(x^2 - 2x + 2)$     | 48. $(x^2 - 4x + 8)(x^2 + 4x + 8)$     |

Simplify, arranging terms in order of decreasing degree of  $x$ . Then write the degree of the polynomial.

1.  $2 - x^2 + 3x + 2x^2 - 5x$

3.  $x^2 + 3x^3 - 3x + x^2 + 2x$

5.  $x^2y^2 - x^2 + 3x^2y^2 + (5xy^2) - 2x^2$

7.  $4x^2yz^3 - xyz + 2x^2yz^3 + 5x^3y^2z^2$

2.  $x^3 - 4x + 7x^2 + 3 + 2x$

4.  $2x^3 - 7 + 5x^2 - x^3 + 3x - x^3$

6.  $4x^2y^3 - xy^2 + 2x^3y - 2xy^2$

8.  $(7xy^2z^3 - 4xy^2z^3) + 2x^2yz^2 - 3xy^2z^3$

In Exercises 9–16, (a) add the polynomials and (b) subtract the second polynomial from the first.

9.  $5m - 4, 2m + 3$

11.  $t^2 - 8t - 7, t^2 + 5t - 6$

13.  $5v^3 - 2v + 1, v^2 + 2v - 2$

15.  $3x^2 - 2xy + 4y^2, 2x^2 + 3y^2$

10.  $3u + 7, u - 8$

12.  $2n^2 - n + 5, n^2 + 1$

14.  $w^3 - w^2 + w - 1, 1 - w - w^2 - w^3$

16.  $4a^2 + 3ab - b^2, b^2 - 2ab$

Simplify.

17.  $3(x^2 - 2x + 4) + 2(5x^2 - 7)$

19.  $2(4m^2 + 3) - 7(m^2 - 2) + 1$

21.  $4a(x - y) + 3a(x + y) + ay$

23.  $3[2p^2 - q(3p + 4q)] - 2[4q^2 - 3p(p - 2q)]$

24.  $4[2a(3a - b) + 3ab] + 5[3b(a + 2b) - 4ab]$

18.  $4(3y^2 - 2y) + 3(y^2 + 5y - 1)$

20.  $5(2n^2 - 3) - 2(5n^2 + 2) - 6$

22.  $2d(3m + n) - 5d(m - 4n) - 10dm$