

Honors Precalculus. Summer Math.

These are the basic skills that you need to be absolutely confident and fluent in. Of course, this list is just a small portion of what you've learned so far and you will be expected to know more, but mastering the following will make it much easier to get through the Precalculus.

- Sets of numbers: natural, whole, integer, rational, irrational, real, non-real.
- Operations with fractions: addition/subtraction/multiplication/division/complex fractions.
- Simplifying radicals. Rationalizing fractions with radicals in denominators.
- Number sense. Comparing real numbers in various forms.
- Divisibility rules for 2, 3, 4, 5, 6, 9, and 10. Memorized and applied.
- Recognition if a number is prime or composite (up to 100.)
- Squares of natural numbers up to 20 memorized.
- Most common Pythagorean triplets: 3-4-5, 5-12-13, 7-24-25, 8-15-17, 9-40-41 memorized.
- SOH-CAH-TOA
- Factoring by grouping.
- Special products: square of a sum/difference; difference of squares. Formulas memorized and applied.
- Sum/difference of cubes. Formulas memorized and applied.
- Quadratic formula. (Lifesaving skill ☺)
- Proportions.

Set of problems to practice are included here.

All the answers and solutions to selected problems are enclosed.

You will be quizzed on it sometime in the first two weeks of school.

We will not be reviewing it during class.

Divisibility Rules Practice Problems. Circle all that apply:

Number:	Is divisible by:							
228	2	3	4	5	6	9	10	
57	2	3	4	5	6	9	10	
102	2	3	4	5	6	9	10	
4516	2	3	4	5	6	9	10	
93	2	3	4	5	6	9	10	
2310	2	3	4	5	6	9	10	
75	2	3	4	5	6	9	10	
450	2	3	4	5	6	9	10	
70	2	3	4	5	6	9	10	
2409	2	3	4	5	6	9	10	

Complete the following problems. All the work should be done without using a calculator:

State if the expressions are equal, opposite and/or reciprocal:			
1. x and $\frac{1}{x}$	2. $\frac{y}{5}$ and $\frac{-y}{5}$	3. $\frac{y}{5}$ and $\frac{y}{-5}$	4. $\frac{y}{5}$ and $\frac{5}{y}$
5. $\frac{a}{b}$ and $\frac{b}{a}$	6. $-\frac{y}{5}$ and $\frac{-y}{5}$	7. $\frac{y}{5}$ and $\frac{-y}{-5}$	8. $\frac{y}{5}$ and $-\frac{5}{y}$
Write the expression opposite to:			
9. x	10. $a - b$	11. $\frac{a}{b}$	12. $\frac{a-3}{b}$
13. $-2p$	14. $2x - y$	15. $\frac{-y}{5}$	16. $\frac{12}{q-p}$
Given that $\frac{1}{a-b} = 7$ find:			
17. $\frac{1}{b-a}$	18. $a - b$	19. $b - a$	20. $\frac{b-a}{3}$
21. Calculate: $\frac{1}{a-b}$ if $a = 4\frac{3}{5}$ and $b = 4.4$			
Calculate:			
22. $\frac{0.75 \cdot 0.4 - 5.7}{1.86 \div 0.31}$	23. $\frac{1.95 \div 1.3 + 2.5}{3.4 \cdot 0.8 + 3.28}$	24. $\frac{2.5 + 3\frac{1}{3}}{2.5 - 3\frac{1}{3}}$	
25. How $\frac{a}{b}$ and $\frac{a}{c}$ are different?	26. Evaluate $\frac{a}{b}$ and $\frac{a}{c}$ for $a = 2, b = 7, c = \pi$.		
For which values of x is the expression undefined?			
27. $\frac{20 + 40x}{20x}$	28. $\frac{2y}{y^2 + 6y}$	29. $\frac{2 + 7x}{x^2 + 6}$	
30. For the fraction to be to zero, its numerator must be equal to zero. <i>True</i> <i>False</i>			
31. If the numerator of a fraction is equal to zero, the fraction is always equal to zero. <i>True</i> <i>False</i>			
Prove that the expression is equal to zero:			
32. $\frac{\left(\frac{1}{4} - \frac{5}{24}\right) \cdot 8 - \frac{1}{3}}{1.85 - 1.62 \div 0.9}$	33. $\frac{\left(1\frac{2}{9} \div 7\frac{1}{3} - \frac{1}{6}\right) \cdot 0.23}{2\frac{1}{8} + 1.2}$		
Prove that the expression is undefined:			
34. $\frac{8.3 \cdot 1.2 + 4.2}{\left(3\frac{3}{5} - 2\frac{1}{15}\right) \cdot 5 - 7\frac{2}{3}}$	35. $\frac{\left(5 - 3\frac{2}{3}\right) \cdot 6 - 7.9}{5.6 \cdot 2.1 - 11.76}$		
36. Show that the sum of any three consecutive integers is divisible by 3.			

Show that the simplified result doesn't depend on the values of the variables:

37. $a(2a + 1) - a^2(a + 2) + a^3 - a + 3$ 38. $4(c - 1) - c^2(2 + 3c) + c(5c - 4) + 3c^2(c - 1)$

Divide polynomial by monomial:

39. $\frac{6a-9b+7}{3}$ 40. $\frac{2x^{m+4}-3x^{m+2}+5x^{m+1}}{2x^{m+1}}$ 41. $\left(\frac{1}{2}a^3b + \frac{1}{3}a^2b - \frac{1}{4}ab^3\right) \div 5ab$

Factor completely by grouping:

42. $a(b + c) + 3(b + c)$ 43. $3x(y - z) - 2wy + 2wz$ 44. $x(y - 5) - y(5 - y)$
 45. $an^2 + cn^2 - ap - cp + ap^2 + cp^2$ 46. $x^2y^2 - x^3 + xy - y^3$

47. Solve: $x^3 + 8x^2 + 5x + 40 = 0$

Multiply using special products formulas (don't FOIL):

48. $(x + 3)(x - 3)$ 49. $(x + 10)(x + 10)$ 50. $(3 - 5n)^2$
 51. $(1 - \frac{1}{2}n)^2$ 52. $(3ab^2 - c^3)(3ab^2 + c^3)$ 53. $(\frac{n^5}{5} + 4)(\frac{n^5}{5} - 4)$
 54. $(-\frac{1}{2}xy - yz)^2$ 55. $(5y^2 + 4np^3)^2$ 56. $(-a^2 + 2ab)^2$

Calculate mentally (Hint: use the special products):

57. $68 \cdot 72$ 58. $(20 + 1)^2$ 59. $201 \cdot 199$ 60. 102^2 61. 97^2

Factor completely (use special products formulas):

62. $x^2 - y^2$ 63. $x^2 + 2xy + y^2$ 64. $4a^2 - 28ab + 49b^2$
 65. $25x^2 + 20x + 4$ 66. $x^3 - 20x^2y + 100xy^2$ 67. $121x^2 - 49y^2$
 68. $a^4 - 4a^2b + 4b^2$ 69. $\frac{16}{25}a^4 - \frac{49}{81}b^6$ 70. $25a^6 - 40a^3b^2 + 16b^4$
 71. $64 - (b + 1)^2$ 72. $\frac{1}{4}x^2 + x + 1$ 73. $5^{2n} - 49$

Find the value of m that will make the polynomial a perfect square:

74. $25x^2 + 30x + m$ 75. $64a^2 - mab + 9b^2$ 76. $49x^8 - 42x^4y^2 + my^4$

Factor completely:

77. $x^3 - 27$ 78. $a^3 + \frac{1}{64}$ 79. $216a^9b^{12} - 125c^6d^{15}$

80. Find all the solutions: $16x^4 + 54x = 0$

Simplify. Rationalize denominators if needed.

81. $\sqrt{18xy^3} \cdot \sqrt{2x^5y}$ 82. $\sqrt{98} - \sqrt{18}$ 83. $\sqrt[3]{\frac{9y}{24y^7}}$ 84. $\frac{3}{\sqrt{x}}$
 85. $\frac{\sqrt{7x}}{\sqrt{2y}}$ 86. $\sqrt[3]{\frac{7x}{2y}}$ 87. $\frac{\sqrt{10}-\sqrt{5}}{\sqrt{5}}$ 88. $\frac{15}{3-\sqrt{2}}$
 89. $\frac{\sqrt{15}-5}{\sqrt{6}-\sqrt{10}}$ 90. $\frac{\sqrt{7}+2}{3-\sqrt{10}}$ 91. $\frac{1+\frac{\sqrt{3}}{3}}{1-\frac{\sqrt{3}}{3}}$ 92. $\sqrt{\frac{1-\frac{\sqrt{2}}{2}}{2}}$

Solve:

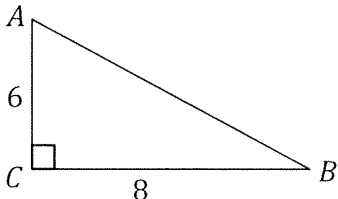
93. $x = \sqrt{25}$ 94. $x^2 = 25$ 95. $(7 + y)^2 = 121$ 96. $a^3 = 64$

97. A Toyota Prius drove 246 miles on 6 gallons of gas. How far should it be able to go on a full, 11 gallon, tank?

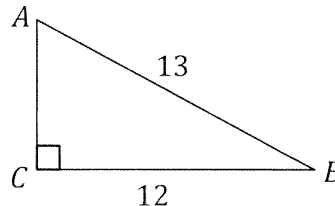
98. A U.S. one dollar coin is made of copper, zinc, manganese, and nickel in the following ratio: 44 : 3 : 2 : 1. Its mass is 8 grams. How many grams of each element are in a one dollar coin?

Evaluate:

99. $\sin(A)$



100. $\tan(B)$



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1. reciprocal	2. opposite	3. opposite	4. reciprocal	5. reciprocal	6. equal
7. equal	8. opposite reciprocal	9. $-x$	10. $b - a$	11. $-\frac{a}{b}$	12. $\frac{3-a}{b}$
13. $2p$	14. $y - 2x$	15. $\frac{y}{5}$	16. $\frac{12}{p-q}$	17. -7	18. $\frac{1}{7}$
19. $-\frac{1}{7}$	20. $-\frac{1}{21}$	21. 5	22. -0.9	23. $\frac{2}{3}$	24. -7
25. $\frac{a}{\frac{b}{c}} = a \div \frac{b}{c} = a \cdot \frac{c}{b} = \frac{ac}{b}$; $\frac{a}{\frac{b}{c}} = \frac{a}{b} \div c = \frac{a}{b} \cdot \frac{1}{c} = \frac{a}{bc}$			26. $\frac{2\pi}{7}$; $\frac{2}{7\pi}$	27. $x = 0$	28. $y = 0, -6$
29. Defined for all x		30. True	31. False	32. $\frac{0}{\neq 0} = 0$	33. $\frac{0}{\neq 0} = 0$
34. $\frac{\neq 0}{0}$ undefined	35. $\frac{\neq 0}{0}$ undefined		36. $\frac{x+(x+1)+(x+2)}{3} = \frac{3x+3}{3} = \frac{3(x+1)}{3} = x + 1$		
37. $a(2a + 1) - a^2(a + 2) + a^3 - a + 3 = 2a^2 + a - a^3 - 2a^2 + a^3 - a + 3 = 3$					
38. $4(c - 1) - c^2(2 + 3c) + c(5c - 4) + 3c^2(c - 1) = 4c - 4 - 2c^2 - 3c^3 + 5c^2 - 4c + 3c^3 - 3c^2 = -4$					
39. $2a - 3b + \frac{7}{3}$	40. $x^3 - \frac{3x}{2} + \frac{5}{2}$	41. $\frac{1}{10}a^2 + \frac{1}{15}a - \frac{1}{20}b^2$	42. $(a + 3)(b + c)$		
43. $(3x - 2w)(y - z)$	44. $(x + y)(y - 5)$	45. $(a + c)(n^2 + p^2 - p)$	46. $(x^2 - y)(y^2 - x)$		
47. $x = -8, \pm\sqrt{5}i$	48. $x^2 - 9$	49. $x^2 + 20x + 100$	50. $9 - 30n + 25n^2$		
51. $1 - n + \frac{1}{4}n^2$	52. $9a^2b^4 - c^6$	53. $\frac{n^{10}}{25} - 16$	54. $\frac{1}{4}x^2y^2 + xy^2z + y^2z^2$		
55. $25y^4 + 40y^2np^3 + 16n^2p^6$		56. $a^4 - 4a^3b + 4a^2b^2$		57. 4896	58. 441
59. 39999	60. 10404	61. 9409	62. $(x + y)(x - y)$	63. $(x + y)^2$	64. $(2a - 7b)^2$
65. $(5x + 2)^2$		66. $x(x - 10y)^2$		67. $(11x + 7y)(11x - 7y)$	68. $(a^2 - 2b)^2$
69. $(\frac{4}{5}a^2 + \frac{7}{9}b^3)(\frac{4}{5}a^2 - \frac{7}{9}b^3)$		70. $(5a^3 - 4b^2)^2$		71. $(9 + b)(7 - b)$	72. $(\frac{1}{2}x + 1)^2$
73. $(5^n + 7)(5^n - 7)$		74. 9	75. 48	76. 9	77. $(x - 3)(x^2 + 3x + 9)$
78. $(a + \frac{1}{4})(a^2 - \frac{1}{4}a + \frac{1}{16})$		79. $(6a^3b^4 - 5c^2d^5)(36a^6b^8 + 30a^3b^4c^2d^5 + 25c^4d^{10})$			

80. $x = 0, -\frac{3}{2}, \frac{3}{4} \pm \frac{3\sqrt{3}}{4}i$	81. $6 x^3 y^2$	82. $4\sqrt{2}$	83. $\frac{\sqrt[3]{3}}{2y^2}$	84. x	85. $\frac{\sqrt{14xy}}{2y}$	86. $\frac{\sqrt[3]{28xy^2}}{2y}$
87. $\sqrt{2} - 1$	88. $\frac{15(3+\sqrt{2})}{7}$	89. $\frac{\sqrt{10}}{2}$	90. $-3\sqrt{7} - \sqrt{70} - 6 - 2\sqrt{10}$		91. $2 + \sqrt{3}$	92. $\frac{\sqrt{2-\sqrt{2}}}{2}$
93. $x = 5$	94. $x = \pm 5$	95. $y = 4, -18$		96. $a = 4$		97. 451 miles.
98. Copper 7.04g, zinc 0.48g, manganese 0.32g, nickel 0.16g.					99. $\frac{4}{5}$	100. $\frac{5}{12}$