

Study Guide for Placement Exam

1. Simplify: $5[2-3(4-8)] =$
2. Simplify: $(-1)^2 + 3(4+5) - (1-3) =$
3. Simplify: $5 \cdot 2 + 12 \div 2^2 =$
4. Simplify: $2[x+3y-2(y-2x)] =$
5. Simplify: $4x+2y-(x-5y)+3y =$
6. If $x = 8$ and $y = -2$, then $xy^2 - 2y =$
7. If $x = 3$ and $y = -5$, then $|x-y| + |2x+y| =$
8. Perform the indicated subtraction and simplify: $\frac{2x}{5y} - \frac{7}{3x} =$
9. Perform the indicated subtraction and simplify: $\frac{4}{x^2-25} - \frac{3}{x+5} =$
10. Perform the indicated multiplication and simplify $\frac{x}{x^2-1} \cdot \frac{x^2-x-2}{x^2-2x} =$
11. Simplify: $\frac{15x^3-12x}{6x^2} =$
12. Perform the indicated division and simplify: $\frac{x^2-9}{x^2-3x-4} \div \frac{x^2-6x+9}{x^2-1} =$
13. Factor. $3x^2 - 2x - 5 =$
14. Factor. $4x^2 - 9y^2 =$
15. Factor. $x^2 - 7x + 12 =$
16. Factor. $x^3 - 2x^2 + 5x - 10 =$
17. Simplify: $\left(\frac{-2x^2}{3x^5}\right)^2 =$
18. Simplify: $\left(\frac{-4xy^3}{x^4y^2}\right)^3 =$
19. Simplify: $(-2x^4y^2)^5 (x^6y^4)^3 =$
20. Solve $4x - 12 = 2(x - 5)$.
21. Solve $\frac{1}{3}x + 2 = \frac{1}{2}(x - 1)$.
22. Solve: $x^2 - 4x = 5$
23. Solve: $2x^2 + 3x - 9 = 0 =$
24. Simplify: $\sqrt{72} =$
25. Simplify: $\sqrt{16a^{12}b^8c^4} =$
26. Simplify: $\sqrt{20x^5y^{12}z} =$
27. Solve $\frac{2}{x-1} = \frac{5}{8}$
28. Solve $\frac{x}{x-2} - 3 = \frac{5}{x-2}$
29. Solve $\frac{x}{x^2-16} - \frac{2}{x+4} = \frac{9}{x-4}$
30. Solve $x^2 + 6x = 7$
31. Solve $2x^2 - 12 = 5x$
32. Solve $|5x-3| + 2 = 8$
33. Solve $2(x-3) > 5-x$

For problems 34-35, perform the indicated multiplication and simplify:

34. $(x+3y)^2 =$
35. $(x+4)(x^2-3x-5) =$
36. Find the intercepts of $3x + 2y = 9$.
37. Find the intercepts of $y = \frac{5}{x+2}$.
38. Solve the system $\begin{cases} x+2y=5 \\ 3x-2y=12 \end{cases}$
39. Solve the system $\begin{cases} 2x+5y=8 \\ 3x-4y=13 \end{cases}$
40. Graph $x+2y=4$.

Study Guide Answers

These pages give solutions and steps to solving the Study Guide Problems. Please note that although there can be more than one correct way to solve some of these problems, only one method is demonstrated.

$$1. 5[2 - 3(4 - 8)] = 5[2 - 3(-4)] = 5[2 - -12] = 5[2 + 12] = 5[14] = 70$$

$$2. (-1)^2 + 3(4 + 5) - (1 - 3) = 1 + 3(9) - (-2) = 1 + 27 + 2 = 30$$

$$3. 5 \cdot 2 + 12 \div 2^2 = 10 + 12 \div 4 = 10 + 3 = 13$$

$$4. 2[x + 3y - 2(y - 2x)] = 2[x + 3y - 2y + 4x] = 2[5x + y] = 10x + 2y$$

$$5. 4x + 2y - (x - 5y) + 3y = 4x + 2y - x + 5y + 3y = 3x + 10y$$

$$6. xy^2 - 2y = 8(-2)^2 - 2(-2) = 8 \cdot 4 + 4 = 32 + 4 = 36$$

NOTE We must square ALL of y , meaning we must square both the 2 and the negative sign.

$$7. |x - y| + |2x + y| = |3 - 5| + |2 \cdot 3 + -5| = |3 + 5| + |6 - 5| = |8| + |1| = 8 + 1 = 9$$

$$8. \frac{2x}{5y} - \frac{7}{3x} = \frac{2x(3x)}{5y(3x)} - \frac{7(5y)}{3x(5y)} = \frac{6x^2}{15xy} - \frac{35y}{15xy} = \frac{6x^2 - 35y}{15xy}$$

$$\begin{aligned} 9. \frac{4}{x^2 - 25} - \frac{3}{x + 5} &= \frac{4}{(x - 5)(x + 5)} - \frac{3}{x + 5} = \frac{4}{(x + 5)(x - 5)} - \frac{3(x - 5)}{(x + 5)(x - 5)} \\ &= \frac{4}{(x + 5)(x - 5)} - \frac{3x - 15}{(x + 5)(x - 5)} = \frac{4 - (3x - 15)}{(x + 5)(x - 5)} \\ &= \frac{4 - 3x + 15}{(x + 5)(x - 5)} = \frac{19 - 3x}{(x + 5)(x - 5)} \end{aligned}$$

NOTE we must subtract the ENTIRE second fraction, not just the "3x" portion.

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

$$11. \frac{15x^3 - 12x}{6x^2} = \frac{3x(5x^2 - 4)}{6x^2} = \frac{5x^2 - 4}{2x}$$

NOTE We can only cancel quantities that are multiplied together. This is why we must first factor the numerator before canceling.

$$12. \frac{x^2-9}{x^2-3x-4} \div \frac{x^2-6x+9}{x^2-1} = \frac{(x-3)(x+3)}{(x-4)(x+1)} \div \frac{(x-3)^2}{(x-1)(x+1)}$$

$$= \frac{(x-3)(x+3)}{(x-4)(x+1)} \cdot \frac{(x-1)(x+1)}{(x-3)^2} = \frac{(x+3)}{(x-4)} \cdot \frac{(x-1)}{(x-3)} = \frac{(x+3)(x-1)}{(x-4)(x-3)}$$

$$13. 3x^2 - 2x - 5 = (3x-5)(x+1)$$

$$14. 4x^2 - 9y^2 = (2x-3y)(2x+3y)$$

$$15. x^2 - 7x + 12 = (x-4)(x-3)$$

$$16. x^3 - 2x^2 + 5x - 10 = x^2(x-2) + 5(x-2) = (x-2)(x^2+5)$$

$$17. \left(\frac{-2x^2}{3x^5}\right)^2 = \frac{4x^4}{9x^{10}} = \frac{4}{9x^6}$$

NOTE You can also correctly work this problem (and numbers 18 and 19) by using the rules of exponents in different orders than what is done here.

$$18. \left(\frac{-4xy^3}{x^4y^2}\right)^3 = \frac{-64x^3y^9}{x^{12}y^6} = \frac{-64y^3}{x^9}$$

$$19. (-2x^4y^2)^5 (x^6y^4)^3 = (-32x^{20}y^{10}) (x^{18}y^{12}) = -32x^{38}y^{22}$$

$$20. 4x - 12 = 2(x - 5)$$

$$4x - 12 = 2x - 10$$

$$2x = 2$$

$$x = 1$$

$$21. \frac{1}{3}x + 2 = \frac{1}{2}(x - 1)$$

$$6\left(\frac{1}{3}x + 2\right) = 6\left[\frac{1}{2}(x - 1)\right]$$

$$2x + 12 = 3(x - 1)$$

$$2x + 12 = 3x - 3$$

$$15 = x$$

$$22. x^2 - 4x = 5$$

$$x^2 - 4x - 5 = 0$$

$$(x-5)(x+1) = 0$$

$$x-5=0, x+1=0$$

$$x=5, x=-1$$

$$23. 2x^2 + 3x - 9 = 0$$

$$(2x-3)(x+3) = 0$$

$$2x-3=0, x+3=0$$

$$2x=3, x=-3$$

$$x=\frac{3}{2}, x=-3$$

$$24. \sqrt{72} = \sqrt{2 \cdot 36} = \sqrt{2 \cdot 6^2} = 6\sqrt{2}$$

$$25. \sqrt{16a^{12}b^8c^4} = \sqrt{4^2a^{12}b^8c^4} = 4a^6b^4c^2$$

$$26. \sqrt{20x^5y^2z} = \sqrt{4 \cdot 5x^5y^2z} = 2x^2y^6\sqrt{5xz}$$

$$27. \frac{2}{x-1} = \frac{5}{8}$$

$$8(x-1)\frac{2}{x-1} = 8(x-1)\frac{5}{8}$$

$$8 \cdot 2 = 5(x-1)$$

$$16 = 5x - 5$$

$$21 = 5x$$

$$\frac{21}{5} = x$$

$$28. \frac{x}{x-2} - 3 = \frac{5}{x-2}$$

$$(x-2)\left(\frac{x}{x-2} - 3\right) = (x-2)\frac{5}{x-2}$$

$$x - 3(x-2) = 5$$

$$x - 3x + 6 = 5$$

$$-2x = -1$$

$$x = \frac{1}{2}$$

$$29. \frac{x}{x^2-16} - \frac{2}{x+4} = \frac{9}{x-4}$$

$$\frac{x}{(x-4)(x+4)} - \frac{2}{x+4} = \frac{9}{x-4}$$

$$(x-4)(x+4)\left[\frac{x}{(x-4)(x+4)} - \frac{2}{x+4}\right] = (x-4)(x+4)\frac{9}{x-4}$$

$$x - 2(x-4) = 9(x+4)$$

$$x - 2x + 8 = 9x + 36$$

$$-10x = 28$$

$$x = -\frac{28}{10} = -\frac{14}{5}$$

$$30. x^2 + 6x = 7$$

$$x^2 + 6x - 7 = 0$$

$$(x+7)(x-1) = 0$$

$$x = -7, 1$$

$$31. 2x^2 - 12 = 5x$$

$$2x^2 - 5x - 12 = 0$$

$$(2x+3)(x-4) = 0$$

$$x = -\frac{3}{2}, 4$$

$$32. |5x-3| + 2 = 8$$

$$|5x-3| = 6$$

$$5x-3 = 6, \quad 5x-3 = -6$$

$$5x = 9, \quad 5x = -3$$

$$x = \frac{9}{5}, \quad x = -\frac{3}{5}$$

$$33. 2x - 6 > 5 - x$$

$$3x > 11$$

$$x > \frac{11}{3}$$

$$34. (x+3y)^2 = x^2 + 6xy + 9y^2$$

$$35. (x+4)(x^2 - 3x - 5) = x^3 - 3x^2 - 5x + 4x^2 - 12x - 20 = x^3 + x^2 - 17x - 20$$

$$36. \text{To find the } y\text{-intercept, we set } x = 0: 3(0) + 2y = 9, 2y = 9, y = \frac{9}{2}$$

$$\text{To find the } x\text{-intercept, we set } y = 0: 3x + 2(0) = 9, 3x = 9, x = 3$$

37. For y -intercept: $y = \frac{5}{0+2} = \frac{5}{2}$. For x -intercept, setting $y = 0$ leads to the false statement $0 = 5$. Thus there is no x -intercept.
38. Solve for x in the first equation to get $x = 5 - 2y$. Substitute this in the second equation to obtain: $3(5 - 2y) - 2y = 12$. Solve this equation for y to obtain $y = \frac{3}{8}$. Plug this value for y back into the equation $x = 5 - 2y$ to obtain $x = 5 - 2\left(\frac{3}{8}\right) = 5 - \frac{6}{8} = 5 - \frac{3}{4} = 4.25$
39. Solve for x in the first equation to obtain to get $x = \frac{8-5y}{2}$. Substitute into the second equation, to obtain $3\frac{8-5y}{2} - 4y = 13$. Multiply this equation by 2 to get $3(8-5y) - 8y = 26$ which then gives $y = -\frac{2}{23}$. Plug this value back into $x = \frac{8-5y}{2}$ to get $x = \frac{97}{23}$.
40. This graph is a line. The x -intercept is at $x = 4$ and the y -intercept is at $y = 2$. The graph looks like:

