

Sample Test Solutions Part 1

Rational Numbers

$$1. \frac{8}{15} \div \frac{2}{5}$$

$$= \frac{8}{15} \cdot \frac{5}{2}$$

$$= \frac{40}{30}$$

$$= \frac{4}{3}$$

$$2. 1\frac{5}{6} + 3\frac{4}{15}$$

$$= \frac{11}{6} + \frac{49}{15}$$

$$= \frac{11}{6} \cdot \frac{5}{5} + \frac{49}{15} \cdot \frac{2}{2}$$

$$= \frac{55}{30} + \frac{98}{30}$$

$$= \frac{153}{30}$$

$$= \frac{51}{10}$$

Percent

3. 42 is 30 % of what number?

$$42 = 0.30 \cdot x$$

$$42(10) = 0.3x(10)$$

$$420 = 3x$$

$$140 = x$$

42 is 30% of 140

4. The Smiths spend 23% of their monthly income on food. Their income in May was \$5,400. How much did they spend on food in May?

$$\begin{aligned} 23\% \text{ of } \$5,400 &= 0.23 \cdot 5400 \\ &= 1,242 \end{aligned}$$

The Smiths spent \$1,242 on food in May.

5. Emily bought a dress for \$60 that originally sold for \$75. What rate of discount did she receive?

The amount of discount is $75 - 60 = 15$.

15 is what percent of 75

$$15 = x \cdot 75$$

$$\frac{15}{75} = \frac{x \cdot 75}{75}$$
$$x = 0.2$$

The rate of discount was 20%.

Integers

6. $6 \cdot 3^2$

$$= 6 \cdot 9$$

$$= 54$$

7. $9 + 4(1 - 5) + 6$

$$= 9 + 4(-4) + 6$$

$$= 9 - 16 + 6$$

$$= -7 + 6$$

$$= -1$$

8. $\frac{(-3)^2 + 5 \cdot 6}{-7 + 4}$

$$= \frac{9 + 5 \cdot 6}{-7 + 4}$$

$$= \frac{9 + 30}{-7 + 4}$$

$$= \frac{39}{-3}$$

$$= -13$$

9. $7 - |3 - 10|$

$$= 7 - |-7|$$

$$= 7 - 7$$

$$= 0$$

Algebraic Expressions

10. Write an expression that represents "thirteen less than one third of x ".

$$\frac{1}{3}x - 13$$

11. Write an expression that represents "forty-two more than half of y ".

$$42 + \frac{1}{2}y$$

12. Evaluate $5x^2 - 3xy + 2y^2$ for $x = 2$ and $y = -3$.

$$5(2)^2 - 3(2)(-3) + 2(-3)^2$$

$$5(4) - 3(2)(-3) + 2(9)$$

$$20 + 18 + 18$$

$$56$$

Algebraic Equations

13. If $9 - 4(7x - 6) = 4x + 27$, then what is the value of x ?

$$9 - 4(7x - 6) = 4x + 27$$

$$9 - 28x + 24 = 4x + 27$$

$$-28x + 33 = 4x + 27$$

$$-28x + 33 + 28x = 4x + 27 + 28x$$

$$33 = 32x + 27$$

$$33 - 27 = 32x + 27 - 27$$

$$6 = 32x$$

$$\frac{6}{32} = x$$

$$x = \frac{3}{16}$$

14. Solve for x : $-5(3 - 2x) = x + 12$

$$-5(3 - 2x) = x + 12$$

$$-15 + 10x = x + 12$$

$$-15 + 10x - x = x + 12 - x$$

$$-15 + 9x = 12$$

$$-15 + 9x + 15 = 12 + 15$$

$$9x = 27$$

$$x = 3$$

Inequalities

15. Which expression is equivalent to $4(2x - 9) < 11x - 6$?

a) $x < -10$ b) $x > -10$ c) $x > 10$ d) $x < -10$

$$\begin{aligned}
4(2x - 9) &< 11x - 6 \\
8x - 36 &< 11x - 6 \\
8x - 36 - 11x &< 11x - 6 - 11x \\
-3x - 36 &< -6 \\
-3x - 36 + 36 &< -6 + 36 \\
-3x &< 30 \\
x &> -10
\end{aligned}$$

The answer is b.

Formulas

16. Solve $A = \frac{1}{2}bh$ for h .

$$\begin{aligned}
A &= \frac{1}{2}bh \\
2 \bullet A &= 2 \bullet \frac{1}{2}bh \\
2A &= bh \\
\frac{2A}{b} &= h
\end{aligned}$$

17. Solve $P = 2(l + w)$ for w .

$$\begin{aligned}
P &= 2(l + w) \\
P &= 2l + 2w \\
P - 2l &= 2w \\
\frac{P - 2l}{2} &= w
\end{aligned}$$

Slope of a Line

18. What is the y-intercept of the line $4x + 5y = 20$?

Rewrite the equation in the slope-intercept form $y = mx + b$; $(0, b)$ is the y-intercept

$$\begin{aligned}
4x + 5y &= 20 \\
5y &= -4x + 20 \\
\frac{5y}{5} &= \frac{-4x}{5} + \frac{20}{5} \\
y &= -\frac{4}{5}x + 4
\end{aligned}$$

The y-intercept of the line is $(0, 4)$

19. What is the y-intercept of the line $-2x = -3y + 15$?

$$\begin{aligned} -2x &= -3y + 15 \\ -2x - 15 &= -3y \\ \frac{-2x}{-3} - \frac{15}{-3} &= \frac{-3y}{-3} \\ \frac{2}{3}x + 5 &= y \\ y &= \frac{2}{3}x + 5 \end{aligned}$$

The y-intercept of the line is (0, 5)

20. What is the slope of the line passing through the points (5, -3) and (-2, 6)?

Use the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$, $x_2 \neq x_1$

$$m = \frac{6 - (-3)}{-2 - 5} = \frac{9}{-7} = -\frac{9}{7}$$

21. What is the slope of the line $8x + 2y = 16$

$$\begin{aligned} 8x + 2y &= 16 \\ 2y &= -8x + 16 \\ \frac{2y}{2} &= \frac{-8x}{2} + \frac{16}{2} \\ y &= -4x + 8 \end{aligned}$$

The slope is -4.

Graphing Linear Equations

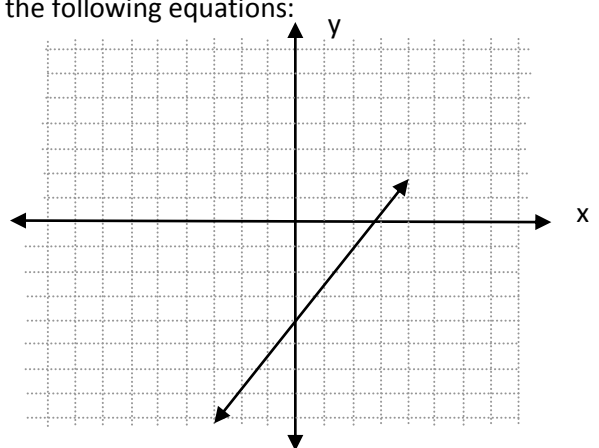
22. The graph represents the solution set of which of the following equations:

a) $2x - 3y = 0$

c) $y = \frac{2}{3}x + 2$

b) $y = \frac{3}{2}x - 3$

d) $x = -\frac{2}{3}y - 3$



Take the y-intercept (0, -3) and the x-intercept (2,0)

and plug them into the slope formula to find the slope

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - (-3)}{2 - 0} = \frac{3}{2}$$

Now write the equation in slope intercept form:

$$y = mx + b$$

$$y = \frac{3}{2}x - 3 \quad \text{The answer is b}$$

23. The graph represents the solution set of which of the following equations:

a) $x = -2$ c) $y = 2$

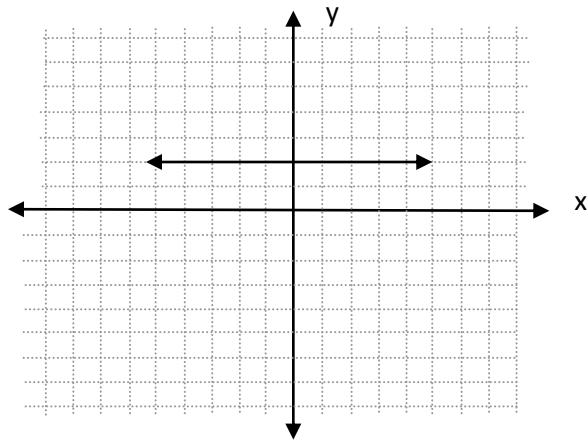
b) $y = -2$ d) $x = 2$

Horizontal lines have slope of 0 (pick any 2 points on the line and find the slope using the slope formula)

The y intercept is (0, -3). Write the equation of the line in slope-intercept form:

$$y = 0x + 2$$

$$y = 2 \quad \text{The answer is c.}$$



Polynomials

24. Simplify: $(6x^3y^2)^2$

$$\begin{aligned} &= 6x^3y^2 \cdot 6x^3y^2 \\ &= (6)(6)x^{3+3}y^{2+2} \\ &= 36x^6y^4 \end{aligned}$$

25. Simplify: $(-7xy^2)(-3x^4y^5)$

$$\begin{aligned} &= (-7)(-3)x^{1+4}y^{2+5} \\ &= 21x^5y^7 \end{aligned}$$

$$\begin{aligned}
26. \text{ Simplify: } & (2a^4bc^5)^3 \\
& = (2)^3(a^4)^3(b)^3(c^5)^3 \\
& = 2^{1 \cdot 3} a^{4 \cdot 3} b^{1 \cdot 3} c^{5 \cdot 3} \\
& = 8a^{12}b^3c^{15}
\end{aligned}$$

$$\begin{aligned}
28. \text{ Simplify: } & 5y(3x - 4y) \\
& = 5y(3x) + 5y(-4y) \\
& = 15xy - 20y^2
\end{aligned}$$

$$\begin{aligned}
30. \text{ Multiply: } & (2x + 3)^2 \\
& = (2x + 3)(2x + 3) \\
& = 4x^2 + 6x + 6x + 9 \\
& = 4x^2 + 12x + 9
\end{aligned}$$

$$\begin{aligned}
32. \text{ Simplify: } & (6x - 3y + 2) - (-3x - 8y + 12) \\
& = 6x - 3y + 2 + 3x + 8y - 12 \\
& = 9x + 5y - 10
\end{aligned}$$

$$\begin{aligned}
34. \text{ Factor: } & -25 + 4x^2 \\
& = 4x^2 - 25 \\
& = (2x + 5)(2x - 5)
\end{aligned}$$

(difference of squares)

$$\begin{aligned}
27. \text{ Simplify: } & \frac{x^{-3}y^4}{x^2y^{-6}} \\
& = x^{-3-2}y^{4-(-6)} \\
& = x^{-5}y^{10} \\
& = \frac{y^{10}}{x^5}
\end{aligned}$$

$$\begin{aligned}
29. \text{ Simplify: } & \frac{x^2y^{-7}z^{-10}}{x^2y^{-5}z} \\
& = x^{2-2}y^{-7-(-5)}z^{-10-1} \\
& = x^0y^{-2}z^{-11} \\
& = \frac{x^0}{y^2z^{11}} \\
& = \frac{1}{y^2z^{11}}
\end{aligned}$$

$$\begin{aligned}
31. \text{ Divide: } & \frac{20xy + 10x^2y^3 - 35x^4y}{5xy} \\
& = \frac{20xy}{5xy} + \frac{10x^2y^3}{5xy} - \frac{35x^4y}{5xy} \\
& = 4 + 2xy^2 - 7x^3
\end{aligned}$$

$$\begin{aligned}
33. \text{ Factor: } & 49y^2 - 100 \\
& = (7y + 10)(7y - 10)
\end{aligned}$$

(difference of squares)

$$\begin{aligned}
35. \text{ Factor completely: } & x^2 + 4y - xy - 4x \\
& = x^2 - xy + 4y - 4x \\
& = x(x - y) + 4(y - x) \\
& = x(x - y) - 4(x - y) \\
& = (x - y)(x - 4)
\end{aligned}$$

(factoring by grouping)

36. Find one of the factors of $8x^2 + 2x - 15$

Factor the trinomial by rewriting the middle term and then factor by grouping. Here's how: multiply the first coefficient by the last coefficient ($8 \bullet (-15) = -120$). Now find two factors of -120 that add up to be the middle coefficient 2 (12 and -10). Now rewrite $2x$ as $12x - 10x$. Then factor by grouping.

$$\begin{aligned}8x^2 + 2x - 15 &= 8x^2 + 12x - 10x - 15 \\ &= 4x(2x + 3) - 5(2x + 3) \\ &= (2x + 3)(4x - 5)\end{aligned}$$

The answer can either be $2x+3$ or $4x - 5$

37. Find the solutions of $x^2 - 6x - 27 = 0$

Factor the trinomial completely like in problem 36, then set each factor equal to 0 and solve for x .

$$\begin{aligned}x^2 - 6x - 27 &= 0 \\ x^2 - 9x + 3x - 27 &= 0 \\ x(x - 9) + 3(x - 9) &= 0 \\ (x - 9)(x + 3) &= 0\end{aligned}$$

$$\begin{array}{ll}x - 9 = 0 & x + 3 = 0 \\ x = 9 & x = -3\end{array}$$

The solutions are $\{9, -3\}$.

38. Solve for x: $x^2 - x - 56 = 0$

This problem is similar to problem 37.

$$x^2 - x - 56 = 0$$

$$x^2 - 8x + 7x - 56 = 0$$

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

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

$$x - 8 = 0 \quad x + 7 = 0$$

$$x = 8 \quad x = -7$$

The solutions are $\{8, -7\}$.

Algebraic Fractions

39. Simplify: $\frac{x^2 - 2x - 48}{2x - 3} \cdot \frac{4x^2 - 9}{x + 6}$

Factor each polynomial completely then divide out and write the answer as a product of factors.

$$\frac{x^2 - 2x - 48}{2x - 3} \cdot \frac{4x^2 - 9}{x + 6} = \frac{(x - 8)\cancel{(x + 6)}}{\cancel{(2x - 3)}} \cdot \frac{(2x + 3)\cancel{(2x - 3)}}{\cancel{(x + 6)}} = \frac{(x - 8)(2x + 3)}{1} = (x - 8)(2x + 3)$$

40. Simplify: $\frac{9x - 36}{x^2 + 10x + 21} \cdot \frac{x^2 - 49}{x - 4}$

This problem is similar to problem 39

$$\frac{9x - 36}{x^2 + 10x + 21} \cdot \frac{x^2 - 49}{x - 4} = \frac{9\cancel{(x - 4)}}{(x + 3)\cancel{(x + 7)}} \cdot \frac{\cancel{(x - 7)}\cancel{(x + 7)}}{\cancel{(x - 4)}} = \frac{9(x - 7)}{x + 3}$$