Changing the Subject #3

Rewrite the following so that x is the subject.

1. $\frac{y}{7} = \frac{z+5}{x}$

2. $y - 3x + 7 \geq 0$

3. $5(x - 2a) = b$

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

5. $a - \frac{x}{5} = 5$

6. $5x + 3 < 4a$

7. $y = \sqrt{x} + 3$

8. $k = 2x^2 - 5$

9. $c = \frac{5}{x+b} + a$

10. $p = \frac{m+5}{x^2}$

11. $p = \sqrt{\frac{3x+2}{n}}$

12. $m = \frac{4x^3}{p}$

13. $n + 3 = \sqrt{5x+1}$

14. $k = 2\cos(3x + 1)$

15. $a = 5(x + 2)^2$

16. $k = \frac{m+4}{\sqrt{qx}}$

Answers for Changing the Subject #3

There are sometimes multiple ways to write the answer – for example $\frac{y+2}{4} = (y+2) \div 4$

The answers here will use a fraction format, which is the best in most situations.

1) $\frac{y}{7} = \frac{z+5}{x} \Rightarrow xy = 7z + 35 \Rightarrow x = \frac{7z+35}{y}$

2) $y - 3x + 7 \geq 0 \Rightarrow y + 7 \geq 3x \Rightarrow \frac{y+7}{3} \geq x$ or $x \leq \frac{y+7}{3}$

3) $5(x - 2a) = b \Rightarrow 5x - 10a = b \Rightarrow x = \frac{b+10a}{5}$ or $x = \frac{b}{5} + 2a$

4) $y = \frac{2x-4}{3} \Rightarrow 3y = 2x - 4 \Rightarrow 3y + 4 = 2x \Rightarrow x = \frac{3y+4}{2}$

5) $a - \frac{x}{5} = 5 \Rightarrow a - 5 = \frac{x}{5} \Rightarrow x = 5(a - 5)$ or $x = 5a - 25$

6) $5x + 3 < 4a \Rightarrow 5x < 4a - 3 \Rightarrow x < \frac{4a-3}{5}$

7) $y = \sqrt{x} + 3 \Rightarrow y - 3 = \sqrt{x} \Rightarrow x = (y - 3)^2$

8) $k = 2x^2 - 5 \Rightarrow k + 5 = 2x^2 \Rightarrow \frac{k+5}{2} = x^2 \Rightarrow x = \pm\sqrt{\frac{k+5}{2}}$

9) $c = \frac{5}{x+b} + a \Rightarrow c - a = \frac{5}{x+b} \Rightarrow (x + b)(c - a) = 5 \Rightarrow x = \frac{5}{c-a} - b$

10) $p = \frac{m+5}{x^2} \Rightarrow p\,x^2 = m + 5 \Rightarrow x^2 = \frac{m+5}{p} \Rightarrow x = \pm\sqrt{\frac{m+5}{p}}$

11) $p = \sqrt{\frac{3x+2}{n}} \Rightarrow p^2 = \frac{3x+2}{n} \Rightarrow np^2 = 3x + 2 \Rightarrow x = \frac{np^2-2}{3}$

12) $m = \frac{4x^3}{p} \Rightarrow mp = 4x^3 \Rightarrow \frac{mp}{4} = x^3 \Rightarrow x = \sqrt[3]{\frac{mp}{4}}$

13) $n + 3 = \sqrt{5x+1} \Rightarrow (n + 3)^2 = 5x + 1 \Rightarrow (n + 3)^2 - 1 = 5x \Rightarrow x = \frac{(n+3)^2-1}{5}$

14) $k = 2\cos(3x + 1) \Rightarrow \frac{k}{2} = \cos(3x + 1) \Rightarrow \cos^{-1}(\frac{k}{2}) = 3x + 1 \Rightarrow x = \frac{\cos^{-1}(\frac{k}{2})-1}{3}$

15) $a = 5(x + 2)^2 \Rightarrow \frac{a}{5} = (x + 2)^2 \Rightarrow \pm\sqrt{\frac{a}{5}} = x + 2 \Rightarrow x = \pm\sqrt{\frac{a}{5}} - 2$

16) $k = \frac{m+4}{\sqrt{qx}} \Rightarrow \sqrt{qx} = \frac{m+4}{k} \Rightarrow qx = (\frac{m+4}{k})^2 \Rightarrow qx = \frac{m^2+8m+16}{k^2}$

$\Rightarrow x = \frac{m^2+8m+16}{q\,k^2}$ or, but this is super ugly, $x = \frac{(\frac{m+4}{k})^2}{q}$