

TOPIC 9

**ALGEBRAIC
EQUATIONS**

VIDEO 1

SOLVE EQUATIONS


A linear equation is where there is only one solution to the equation.

The degree of the equation is one.

2020-04-20

Equations


Topic 9: Exercise 1

$$1.) \quad 4x - 2 = 10$$


$$4x = 10 + 2$$

$$\frac{4x}{4} = \frac{12}{4}$$

$$\therefore x = 3$$

$$2.) \quad -6x + 4 = -14$$


$$-6x = -14 - 4$$

$$\frac{-6x}{-6} = \frac{-18}{-6}$$

$$\therefore x = 3$$

Topic 9: Exercise 1

$$3.) \quad \frac{x}{3} = 4 \times 3$$

$$x = 12$$

or

$$\frac{x}{3} = \frac{4 \times 3}{1 \times 3} \quad \text{LCD:3}$$

$$\frac{x}{3} = \frac{12}{3} \quad \text{drop LCD}$$

$$x = 12$$

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

$$\frac{x-3}{2} = -\frac{2 \times 2}{1 \times 2} \quad \text{LCD:2}$$

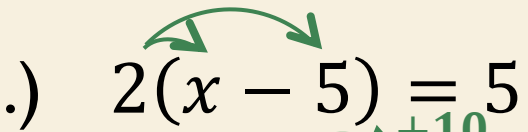
$$\frac{x-3}{2} = -\frac{4}{2}$$

$$x - 3 = -4 \quad \text{Drop LCD}$$

$$x = -4 + 3$$

$$x = -1$$

Topic 9: Exercise 1

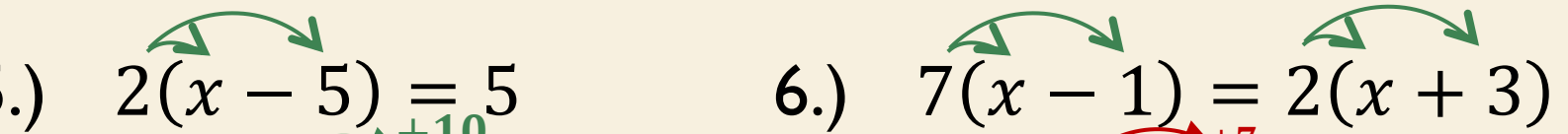
$$5.) \quad 2(x - 5) = 5$$


$$2x - 10 = 5$$

$$2x = 5 + 10$$

$$\frac{2x}{2} = \frac{15}{2}$$

$$x = \frac{15}{2}$$

$$6.) \quad 7(x - 1) = 2(x + 3)$$


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

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

$$\frac{5x}{5} = \frac{13}{5}$$

$$x = \frac{13}{5}$$

Topic 9: Exercise 1

$$7.) \quad \frac{x}{2} - \frac{3}{4} = -1 + \frac{5}{4}$$

$$\frac{x^{\times 2}}{2} - \frac{3^{\times 1}}{4} = \frac{-1^{\times 4}}{1} + \frac{5^{\times 1}}{4}$$

$$\frac{2x}{4} - \frac{3}{4} = \frac{-4}{4} + \frac{5}{4} \quad \text{LCD:4}$$

$$2x - 3 = -4 + 5$$

$$2x = -4 + 5 + 3$$

$$\frac{2x}{2} = \frac{4}{2}$$

$$x = 2$$

$$8.) \quad \frac{x}{3} - \frac{2x-1}{4} = 2$$

$$\frac{x^{\times 4}}{3} - \frac{[2x-1]^{\times 3}}{4} = \frac{2^{\times 12}}{1}$$

$$\frac{4x}{12} - \frac{3(2x-1)}{12} = \frac{24}{12} \quad \text{LCD:12}$$

$$4x - 3(2x - 1) = 24$$

$$4x - 6x + 3 = 24$$

$$-2x = 24 - 3$$

$$-2x = 21$$

$$x = \frac{21}{-2}$$

Topic 9: Exercise 1

$$9.) \quad \frac{2}{3}(2x - 4) = \frac{4}{5}$$

$$\frac{2(2x-4)}{3} = \frac{4}{5}$$

$$5 \times \frac{4x-8}{3} = \frac{3 \times 4}{3 \times 5} \quad \text{LCD:15}$$

$$\frac{5(4x-8)}{15} = \frac{3(4)}{15}$$

$$5(4x - 8) = 3(4) \quad \text{Drop LCD}$$

$$20x - 40 = 12$$

$$20x = 12 + 40$$

$$20x = 52$$

$$x = \frac{52}{20} = \frac{13}{5}$$

Ex 9.1 Pg. 77

(1a, 2abc, 3, 4ac, 5bcd)

EXERCISE 9.1

- What number divided by 12 gives an answer of 72?
 - What number must be added to 8 to get an answer of -23 ?
 - What number when multiplied by 15 gives -90 ?
- Solve the following equations:
 - $x + 7 = 15$
 - $m - 2 = 17$
 - $5y = 3y + 12$
 - $13p - 6 = 33$
 - $5a - 22 = a - 2$
 - $n - 4 = -6$
- Solve for x :
 - $\frac{x}{2} = 25$
 - $\frac{x}{-3} = 12$
 - $\frac{x}{7} + 2 = -5$
 - $\frac{x-6}{2} = -1$
 - $\frac{2x-3}{2} - \frac{3x+1}{4} = 1$
 - $\frac{2(x-1)}{3} - \frac{3}{4} = \frac{3(2x+3)}{2} - 3$
- Solve for x :
 - $3(x-2) = 2(x-4)$
 - $2(2x-4) = 3(3x+4)$
 - $6 - 2(x-1) = 4x - 16$
 - $2(2x+9) - 2(x+3) = x + 11 - 5(4-x)$
- Solve the following equations:
 - $4(7x+6) = 3(9x+8)$
 - $\frac{x}{6} + x + 2 = x + \frac{5}{2}$
 - $\frac{x+3}{4} - \frac{x}{2} = \frac{x+2}{8} - 1$
 - $\frac{3}{4}(3x-5) - \frac{9}{4} = \frac{1}{2}(2x+4)$

TOPIC 9

**ALGEBRAIC
EQUATIONS**

VIDEO 2

EQUATIONS WITH EXPONENTS

If the unknown part is part of the base, you need to isolate the variable and root the other side.

$$\begin{aligned} 1.) \quad 3x^2 - 2 &= 46 \\ 3x^2 &= 46 + 2 \\ \frac{3x^2}{3} &= \frac{48}{3} \\ \sqrt{x^2} &= \sqrt{16} \\ x &= 4 \end{aligned}$$

$$\begin{aligned} 2.) \quad \frac{2x^5}{2} &= \frac{64}{2} \\ \sqrt[5]{x^5} &= \sqrt[5]{32} \\ x &= 2 \end{aligned}$$

$$\begin{aligned} 3.) \quad \frac{1}{3}x^3 &= 9 \\ \frac{1x^3}{3} &= 9 \times 3 \\ \sqrt[3]{x^3} &= \sqrt[3]{27} \\ x &= 3 \end{aligned}$$

EQUATIONS WITH EXPONENTS

If the unknown is part of the exponent, make the bases the same on both sides of the equation.

$$2^{x-1} = 8 \quad \text{Change to prime/same bases}$$

$$2^{x-1} = 2^3$$

$$x - 1 = 3 \quad \text{Drop bases of 2}$$

$$x = 3 + 1 \quad \text{Solve for } x$$

$$x = 4$$

EXAMPLES

$$1.) \quad \frac{2(3^x)}{2} = \frac{486}{2}$$

$$3^x = 243$$

$$3^x = 3^5 \quad \text{Same bases}$$

$$x = 5 \quad \text{Drop bases}$$

$$2.) \quad 4^{-x} = 256$$

$$4^{-x} = 4^4 \quad \text{Same bases}$$

$$-x = 4 \quad \text{Drop bases}$$

$$x = -4$$

EXAMPLES

$$3.) \quad 3^{x+2} = \frac{1}{81}$$

$$3^{x+2} = \frac{1}{3^4}$$

Bring base over the fraction line.
(Exponent changes to negative)

$$3^{x+2} = 3^{-4}$$

$$x + 2 = -4 \quad \text{Drop bases}$$

$$x = -4 - 2 \quad \text{Solve for } x$$

$$x = -6$$

$$4.) \quad 5^x = 0,04 \quad \text{Write decimal as fraction}$$

$$5^x = \frac{4}{100}$$

$$5^x = \frac{1}{25} \quad \text{Simplify fraction}$$

$$5^x = \frac{1}{5^2} \quad \text{Same Bases}$$

$$5^x = 5^{-2} \quad \text{Bring base over the fraction line. (Exponent changes to negative)}$$

$$x = -2$$

Drop Bases

TOPIC 9

**ALGEBRAIC
EQUATIONS**

VIDEO 3

EQUATIONS WITH EXPONENTS

MORE EXAMPLES

1.) $7^{x+2} = \frac{1}{49}$ Make Bases Same

$7^{x+2} = \frac{1}{7^2}$ Bring base over the fraction line.

$7^{x+2} = 7^{-2}$ Drop bases

$x + 2 = -2$ Solve for x

$x = -2 - 2$

$x = -4$

2.) $3x^3 - 2 = 79$

$3x^3 = 79 + 2$

$3x^3 = 81$

$\sqrt[3]{x^3} = \sqrt[3]{27}$

$x = 3$

COMPLICATED EXAMPLES

$$x^{\frac{3}{4}} = 8$$

Change to Prime Bases

$$x^{\frac{3}{4}} = 2^3$$

$$\left(x^{\frac{3}{4}}\right)^{\frac{4}{3}} = \left(2^3\right)^{\frac{4}{3}}$$

Raise the base to the power of the inverse fraction and multiply exponents

$$x = 2^4$$

$$x = 16$$

COMPLICATED EXAMPLES

$$2x^{-\frac{2}{3}} = 32$$

Divide Both Sides by 2

$$x^{-\frac{2}{3}} = 16$$

Write 16 as a prime base

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

$$\left(x^{-\frac{2}{3}}\right)^{-\frac{3}{2}} = \left(2^4\right)^{-\frac{3}{2}}$$

Raise the base to the power of the inverse fraction and multiply exponents

$$x = 2^{-6}$$

Never leave exponents as negative

$$x = \frac{1}{2^6}$$

$$x = \frac{1}{64}$$

Ex 9.2 Pg. 78 (No. 1, 2, 5)

EXERCISE 9.2

1. Solve for x :

a) $2^{x+1} = 16$

b) $3^x = \frac{1}{27}$

c) $2^{-x} = 32$

d) $8^x = 16$

e) $5^{2x-1} = 0,008$

f) $10^x = 0,0001$

2. Solve for x

a) $x^{\frac{3}{4}} = 8$

b) $2x^{-\frac{2}{3}} = 32$

c) $\frac{1}{3}x^5 = 81$

d) $2x^3 - 4 = 246$

3. If $5^{-2} \times 5^x = 1$, solve for x .

4. The product of the square of a number and the cube of the same number is equal to 32. Find the number.

5. Find the value of x if $\frac{a \times a^3}{\sqrt{a^2}} = a^x$

Revision Ex Pg. 81 (No. 1, 2, 3, 4, 5)

Revision

- A number, increased by four times the number, is 35. Find the number. (2)
- Solve the following equations:
 - $6a + 2 = 74$ (2)
 - $9n - 3 = -66$ (2)
 - $\frac{b}{4} = 5$ (1)
 - $\frac{2x-1}{3} = -5$ (3)
 - $\frac{y+1}{2} = \frac{2y+1}{5} - 1$ (4)
- Solve for x :
 - $5(x - 2) = 3x - 4$ (3)
 - $3(2x - 7) = 2(x - 3)$ (3)
 - $4(2x - 1) = 2(2x + 3) + 2$ (4)
- Solve for x :
 - $3^{x-1} = 81$ (2)
 - $4^{-x} = 32$ (2)
 - $2^x = 0,125$ (2)
- The product of the square of a number and the cube of the same number is equal to 243. Find the number. (3)