

Solve each equation. Check each solution.

1) $\frac{x}{5} = \frac{x+3}{8}$

$5x+15=8x$
 $15=3x$
 $x=5$

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

$2x^2-3x=20$
 $2x^2-3x-20=0$
 $(2x+5)(x-4)=0$

$x = -\frac{5}{2}$
 $x = 4$

2) $\frac{1}{5x} = \frac{1}{9x}$

$5x=9x$ no solution
 $4x=0$
 $x=0$ extraneous

$\frac{6x}{21} \left(\frac{5}{2x} - \frac{2}{3} \right) \left(\frac{1}{x} + \frac{5}{6} \right) \frac{6x}{1}$

$\frac{5 \cdot 6x}{2x} - \frac{2 \cdot 6x}{3} = \frac{1 \cdot 6x}{x} + \frac{5 \cdot 6x}{6}$
 $15 - 4x = 6 + 5x$

$9x=9$
 $x=1$

23) A passenger train travels 392 miles in the same time that it takes a freight train to travel 322 miles. If the passenger train travels 20 mph faster than the freight train, find the speed of each train.

P	D	R	T
	392	$\frac{392}{t}$	t
F	322	$\frac{322}{t}$	t

$\frac{322}{t} + 20 = \frac{392}{t}$
 $\frac{322+20t}{t} = \frac{392}{t}$

$322+20t=392$
 $20t=70$
 $t = \frac{7}{2} = 3.5$

$\frac{392}{3.5} = 112$ mph passenger
 $\frac{322}{3.5} = 92$ mph freight

25) One pump can fill a tank with oil in 4 hours. A second pump can fill the same the same tank in 3 hours. If both pumps are used at the same time, how long will they

	Rate	Time	Tanks
P1	$\frac{1}{4}$	4	1
P2	$\frac{1}{3}$	3	1
Together	$\frac{1}{4} + \frac{1}{3}$	t	1

$\frac{3}{3} \frac{1}{4} + \frac{1}{3} \frac{1}{3}$
 $\frac{3+4}{12} = \frac{7}{12}$

$\frac{7}{12} \cdot t = 1$
 $t = \frac{12}{7}$ hrs

Solve for c.

29) $\frac{1}{c} - \frac{c}{a^2 - b^2} = 0$

$\frac{1}{c} = \frac{c}{(a+b)(a-b)}$

$c^2 = a^2 - b^2$
 $c = \pm \sqrt{a^2 - b^2}$

Solve for B.

31) $\frac{q}{m} = \frac{2V}{B^2 r^2}$

$2Vm = B^2 r^2 q$

$B^2 = \frac{2Vm}{r^2 q}$

$B = \pm \sqrt{\frac{2Vm}{r^2 q}}$

33) **Test Scores** On the first of four tests of the term your score is 84%. You think you can score 96% on each of the remaining tests. How many consecutive test scores of 96% would you need to bring your average up to a 90% for the term?

$\frac{84 + 96n}{n+1} = 90$

$84 + 96n = 90n + 90$
 $6n = 6$
 $n = 1$

1 test score of 96

34) You are planning a school field trip to a local theater. It cost \$60 to rent the bus. Each theater ticket cost \$5.50.

a. Write a function $c(x)$ to represent the cost per student if x students signed up.

$$c(x) = \frac{60}{x} + 5.50 \quad \text{or} \quad c(x) = \frac{60 + 5.50x}{x}$$

b. How many students must sign up if the cost is to be no more than \$10 per student?

$$10 \geq \frac{60}{x} + 5.50$$

$$\frac{60}{x} \leq 4.50$$

$$\frac{60}{4.5} \leq x$$

$$x \geq 13.3$$

At least 14 students must sign up

36) **Fuel Economy** Suppose you drive an average of 15,000 miles per year, and your car gets 24 miles per gallon. Suppose gasoline costs \$1.60 a gallon.

a. How much money do you spend each year on gasoline?

$$15000 \text{ mi} \cdot \frac{1 \text{ gall}}{24 \text{ mi}} = \frac{15000}{24} \text{ gall} \rightarrow 625 \text{ gall} \cdot \frac{\$1.60}{\text{gall}} = \boxed{\$1000}$$

b. You plan to trade in your car for one that gets x more miles per gallon. Write an expression to represent the new yearly cost of gasoline.

$$\frac{15000}{24+x} \cdot 1.6 = \frac{24000}{24+x}$$

c. Write an expression to represent your savings on gasoline.

$$1000 - \frac{24000}{24+x}$$

d. Suppose you save \$200 a year with the new car. How many miles per gallon does the new car get?

$$1000 - \frac{24000}{24+x} = 200$$

$$\frac{24000}{24+x} = 800$$

$$24000 = 19200 + 800x$$

$$800x = 4800$$

$$x = 6$$

$$\frac{24+6}{30} = \boxed{30 \text{ miles per gallon}}$$

Solve each equation. Check each solution.

43) $\frac{2}{x-3} - \frac{4}{x+3} = \frac{8}{x^2-9}$

$x = 5$

$$\frac{2(x+3) - 4(x-3)}{x^2-9} = \frac{8}{x^2-9}$$

$$2x+6 - 4x+12 = 8$$

$$-2x+18 = 8$$

$$-2x = -10$$

44) $\frac{1}{8} + \frac{5x}{x+2} = \frac{5}{2}$

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

$$\frac{5x}{x+2} = \frac{19}{8}$$

$$40x = 19x + 38$$

$$21x = 38$$

$x = \frac{38}{21}$

$$45) \frac{(x+5)(x-5) \cdot 1}{x-5} = \frac{x}{x^2-25} (x+5)(x-5)$$

$$x+5 = x$$

no solution

$$46) \frac{k}{k+1} + \frac{k}{k-2} = 2$$

$$5k = -4$$

$$k = \frac{-4}{5}$$

$$\frac{k^2 + 2k + k^2 + k}{(k+1)(k-2)} = 2$$

$$2k^2 + 3k = 2(k^2 - k - 2)$$

$$2k^2 + 3k = 2k^2 - 2k - 4$$

$$51) \frac{7x+3}{x^2-8x+15} - \frac{3x}{x-5} = \frac{1}{3-x}$$

$$\frac{7x+3}{(x-5)(x-3)} - \frac{3x}{x-5} = -\frac{1}{x-3}$$

$$7x+3 - 3x(x-3) = -(x-5)$$

$$7x+3 - 3x^2 + 9x = -x+5$$

$$-3x^2 + 16x + 3 = -x + 5$$

$$-3x^2 + 17x - 2 = 0$$

$$3x^2 - 17x + 2 = 0$$

$$x = \frac{17 \pm \sqrt{265}}{6}$$

$$49) \frac{5}{x^2-7x+12} - \frac{2}{3-x} = \frac{5}{x-4}$$

no solution

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

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

$$5 + 2x - 8 = 5x - 15$$

$$-3 = 3x - 15$$

$$3x = 12$$

$$x = 4$$

$$52) \frac{2}{x+3} + \frac{3}{x-4} = \frac{2x-2}{x^2-x-12}$$

$$(x-4)(x+3)$$

$$2x - 8 + 3x + 9 = 2x - 2$$

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

$$3x + 1 = -2$$

$$3x = -3$$

$$x = -1$$

57) A salesman drove from his home to a nearby city at an average speed of 40 mph. He returned home at an average speed of 60 mph. What was his average speed for the entire trip?

$$d = vt$$

$$d = 40t_1$$

$$d = 60t_2$$

$$\frac{2d}{\frac{d}{40} + \frac{d}{60}}$$

$$\frac{2d}{\frac{100d}{240d}}$$

$$= 2d \cdot \frac{240d}{100d} = \frac{4800d}{100d} = 48 \text{ mph}$$

$$48 \text{ mph}$$

58) An automatic pitching machine can pitch all its baseballs in $1\frac{1}{4}$ hours. One attendant can retrieve all the baseballs pitched by one machine in $3\frac{1}{2}$ hours. At least how many attendants working at the same rate should be hired so that the baseballs from 10 machines are all retrieved in less than 8 hours?

pitched at same time? 1 attendant
pitched not at same time
combined: $r = \frac{n}{3.5}$ "10 jobs"
 $t = \frac{10}{\frac{n}{3.5}} = \frac{35}{n} < 8$
 $n > \frac{35}{8}$
 $n > 4.375$

$$r = \frac{1}{3.5} \text{ 1 attendant}$$

$$\text{combined: } \frac{n}{3.5} \text{ (1 job)}$$

$$\frac{1}{\frac{n}{3.5}} = \frac{3.5}{n} < 8$$

$$n > \frac{3.5}{8}$$

At least 5 attendants