• D 1) $D = rt$

$Time = \frac{D}{r}$

x = speed on 1st leg

$2x$ = speed on 2nd leg

LCD = 2x

$T_{1st} + T_{2nd}$ Total

$2x\left(\dfrac{120}{x} + \dfrac{300}{2x} = 9\right)$

30 mi/hr on 1st leg

60 mi/hr on 2nd leg

$240 + 300 = 18x$

$30 = x$

$\dfrac{120}{30} = 4\,hrs$

Mary was stuck in traffic for 4 hours

• D 2) x = speed of freight train

$x + 20$ = speed of passenger train

Time p = Time f

LCD = x(x+20)

$x(x+20)\left(\dfrac{390}{x+20} = \dfrac{270}{x}\right)$

$390x = 270x + 5400$

$120x = 5400$

$x = 45$ mi/hr, speed of freight train

$x + 20 = 24.5$ mi/hr speed of passenger train

• D 3) Time Going = Time returning + 2

x = speed on skateboard

$2x$ = speed on bike

LCD = 2x

$2x\left(\dfrac{24}{x} = \dfrac{24}{2x} + 2\right)$

$48 = 24 + 4x$

$24 = 4x$

$6 = x$ $2x = 12$

The average speed on the bike was 12 miles/hr

W 4) x = the time it will take to fill the
pool using both hoses

$$LCD = 60x$$

$$60x\left(\frac{1}{12} + \frac{1}{15} = \frac{1}{x}\right)$$

hose1   hose2   together

$$5x + 4x = 60$$
$$9x = 60$$
$$x = \frac{20}{3} = 6\frac{2}{3} \text{ hr}$$
$$\text{or } 6 \text{ hrs } 40 \text{ minutes}$$

It will take 6 hours and 40 minutes to
fill the pool using both hoses.

W 5) x = time to complete the yard work

for son

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

Joe   son   together $LCD = 6x$

$$2x + 6 = 3x$$
$$6 = x$$

It would take his son 6 hours to
complete the yard work if he is working
by himself.

W 6) $2x$ = time it will take Cliff to paint
the office by himself
x = time it will take Norm to paint

$$10x\left(\frac{1}{2x} + \frac{1}{x} = \frac{1}{5}\right) \qquad LCD = 10x$$

$$5 + 10 = 2x$$
$$15 = 2x$$
$$7.5 = x$$

It will take Cliff 15 hours to
paint the office

N W 7] $x =$ time it takes 2 painters to paint a house

$$24x\left(\frac{1}{12} + \frac{1}{8} = \frac{1}{x}\right) \qquad LCD = 24x$$

$$2x + 3x = 24$$
$$5x = 24$$
$$x = 4.8 \text{ hours}$$

It will take 4.8 hours working together.

N W 8] $x =$ time it takes the slower pipe.
$.8x =$ time it takes the faster pipe

$$\frac{1}{x} + \frac{1}{.8x} = \frac{1}{5} \qquad LCD = 40x$$

$$40x\left(\frac{1}{x} + \frac{10}{8x} = \frac{1}{5}\right)$$

$$40 + 50 = 8x$$
$$90 = 8x$$
$$11.25 \text{hrs} = x$$

It will take the slower pipe 11.25 hours.

W 9] $x =$ time it takes Maria
$2x =$ time it takes Paco

$$\frac{1}{x} + \frac{1}{2x} = \frac{1}{4.5}$$

$$18x\left(\frac{1}{x} + \frac{1}{2x} = \frac{2}{9}\right) \qquad LCD = 18x$$

$$18 + 9 = 4x$$
$$27 = 4x$$
$$6.75 = x$$

It would take Maria 6.75 hours and it would take Paco 13.5 hours.

N **D 10)** x = speed without covering
$x+10$ = speed with covering

$2x(x+10)\left(\dfrac{75}{x} = \dfrac{75}{x+10} + 2\right)$ LCD $= 2x(x+10)$

$150(x+10) = 150x + 4x(x+10)$
$150x + 1500 = 150x + 4x^2 + 40x$
$1500 = 4x^2 + 40x$
$0 = 4x^2 + 40x - 1500$
$0 = x^2 + 10x - 375$
$0 = (x + 25)(x - 15)$
$x = -25 \qquad x = 15$

No negative speed

The speed of the trip using the covering was 25 miles per hour.

N **D 11)** x = speed jogging uphill
$x+4$ = speed jogging downhill

$x(x+4)\left(\dfrac{5}{x+4} = \dfrac{3}{x}\right)$ LCD $= x(x+4)$

$5x = 3(x+4)$
$5x = 3x + 12$
$2x = 12$
$x = 6$
$x+4 = 10$

Rosa jogs 6 mph uphill and 10 mph downhill

W **12)** x = time it takes Tim to stuff envelopes
$3x$ = time it takes Tim's daughter

$12x\left(\dfrac{1}{x} + \dfrac{1}{3x} = \dfrac{1}{4}\right)$ LCD = $12x$

$12 + 4 = 3x$ $x = 5\frac{1}{3}$ hours 5 hours 20 mins
$16 = 3x$ $3x = 16$ hours
$5\frac{1}{3}$ hrs $= x$

It would take Tim 5 hours 20 mins and his daughter 16 hrs.

W 13] x = time it takes Adrian to weed
2x = time it takes son

$$\left(\frac{1}{x} + \frac{1}{2x} = \frac{1}{3}\right)6x \qquad LCD = 6x$$

$$6 + 3 = 2x$$
$$9 = 2x$$
$$4.5 \text{ hrs} = x$$

It will take Adrian 4.5 hours + his son 9 hours

D 14] x = speed of hiker
x + 2 = speed of jogger

$$x(x+2)\left(\frac{15}{x+2} = \frac{10}{x}\right) \qquad LCD = x(x+2)$$

$$15x = 10(x + 2)$$
$$15x = 10x + 20$$
$$5x = 20$$
$$x = 4 \qquad\qquad x + 2 = 6$$

The jogger was traveling at 6mph and
the hiker was traveling at 4 mph

W 15] x = the time it takes Maria
x - 9 = the time it takes Felipe

$$20x(x-9)\left(\frac{1}{x} + \frac{1}{x-9} = \frac{1}{20}\right) \qquad LCD = 20x(x-9)$$

$$20(x-9) + 20x = x(x-9)$$
$$20x - 180 + 20x = x^2 - 9x$$
$$0 = x^2 - 49x + 180$$
$$0 = (x - 4)(x - 45)$$
$$x = 4 \text{ or } 45$$

Since x = 4 will give Felipe a negative
time, we can eliminate it.

$$x - 9 = 36$$

It would take Maria 45 hours + Felipe 36 hours.

W **16]** x = time it takes the new employee

$x-2$ = time it takes the experienced employee

$$\frac{1}{x} + \frac{1}{x-2} = \frac{1}{2.4} \qquad LCD = 24x(x-2)$$

$24x(x-2)\left(\frac{1}{x} + \frac{1}{x-2} = \frac{10}{24}\right)$

$$24(x-2) + 24x = 10x(x-2)$$
$$24x - 48 + 24x = 10x^2 - 20x$$
$$0 = 10x^2 - 68x + 48$$
$$= (x-2)(10x - 48) = 0$$
$$x = 2 \qquad x = 4.8$$

Since $x-2 = 0$ time we omit 2

But 4.8 and 2.8 do not work.

So they can't get the job done in 2.4 hours!

D **17]** x = Steve's speed

$x+10$ = Paula's speed

$3x(x+10)\left(\frac{100}{x} = \frac{100}{x+10} + \frac{1}{3}\right) \qquad LCD = 3x(x+10)$

$$300(x+10) = 300x + x(x+10)$$
$$300x + 3000 = 300x + x^2 + 10x$$
$$0 = x^2 + 10x - 3000$$
$$= (x+60)(x-50)$$
$$x = -60, \ 50$$

Omit -60 $x = 50$ $x+10 = 60$

Steve's speed is 50mph and Paula's is 60mph.

D **18]** x = speed of 1st trip $x + 50$ = speed of 2nd trip

$$\frac{1000}{x} = \frac{2025}{x+50} - 2 \qquad LCD = x(x+50)$$

$$1000(x+50) = 2025x - 2x(x+50)$$
$$1000x + 50,000 = 2025x - 2x^2 - 100x$$
$$2x^2 - 925x + 50,000 = 0 \qquad \boxed{\begin{array}{l} x = 400 \\ x = 62.5 \end{array}}$$
$$(2x - 125)(x - 400) = 0$$