

Black Practice Test Answer Key  
Solving Multi-Step Equations

① a)  $(20 - \frac{(4n)^2}{2n}) - 27 = -1$

$$20 - \frac{16n^2}{2n} - 27 = -1$$

$$2n$$

$$20 - 8n - 27 = -1$$

$$-7 - 8n = -1$$

$$-8n = -1 + 7$$

$$-8n = 6$$

$$n = \frac{6}{-8}$$

$$-\frac{3}{4}$$

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

Check

$$(20 - \frac{(4 \cdot \frac{-3}{4})^2}{2 \cdot \frac{-3}{4}}) - 27 = -1$$

$$(20 - \frac{(-3)^2}{-\frac{3}{2}}) - 27 = -1$$

$$(20 - \frac{9}{-\frac{3}{2}}) - 27 = -1$$

$$20 - -6 - 27 = -1$$

$$26 - 27 = -1$$

$$-1 = -1 \checkmark$$

② First note that two powers of 3 are equal if and only if the exponents are equal.

Thus find  $x$ :

$$2x^2 - 5x + 2 = 2x^2 + 7x - 4$$

Subtract  $2x^2$  from both sides. You are left with:

$$-5x + 2 = 7x - 4$$

$$-5x - 7x = -4 - 2$$

$$-12x = -6$$

$$-12x = -6$$

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

③  $n =$  the least integer

$$40n + 780 = 100$$

← the sum of  $1+2+3+\dots+39$

$$40n = 100 - 780$$

$$40n = -680$$

$$40$$

$$n = -17$$

The smallest integer is  $-17$ .  $-17 + 39 = 22$

\* The largest integer is  $22$ .

Including  $-17$  there are 40 integers.

④  $S =$  age of the student

$$S = \frac{1}{2}(3S) - 9$$

← teacher's age

$$S = \frac{3}{2}S - 9$$

$$S - \frac{3}{2}S = \frac{3}{2}S - 9 - \frac{3}{2}S$$

$$-\frac{1}{2}S = -9$$

$$-\frac{1}{2}S \cdot -2 = -9 \cdot -2$$

$$S = 18$$

Check

$$S = \frac{1}{2}(3 \cdot 18) - 9$$

$$S = \frac{1}{2}(54) - 9$$

$$S = 27 - 9$$

$$S = 18$$

$$18 = 18 \checkmark$$

The student is 18 years old.

⑤ a)  $5 + 2x - 9 = 7x - 4 - 5x$  b)  $3(x-4) - x = 2(x-6)$

$$-4 + 2x = -4 + 2x$$

$$-4 = -4$$

This is an identity.

$$3x - 12 - x = 2x - 6$$

$$2x - 12 = 2x - 6$$

$$-12 = -6$$

No solution.

$$t = x + xy$$

$$t = x(1+y)$$

$$\frac{t}{1+y} = x \quad ; \quad y \neq -1$$

restriction

$$\textcircled{7} \quad \begin{cases} t = 5u-1 \\ u^2 = t-5 \end{cases}$$

Substitution

$$u^2 = (5u-1)-5$$

$$u^2 - 5u = -6$$

$$u^2 - 5u + 6 = 0$$

$$(u-2)(u-3) = 0$$

$$u=2 \quad \text{or} \quad u=3$$

Answer: 92

$$t = 5u-1 \quad \text{or} \quad t = 5u-1$$

$$t = 5 \cdot 2 - 1 \quad t = 5 \cdot 3 - 1$$

$$t = 10-1 \quad t = 15-1$$

$$t = 9 \quad t = 14$$

$$8. \quad a) \quad 17.4 + 8.7x = 13.2x$$

$$17.4 = 13.2x - 8.7x$$

$$17.4 = 4.5x$$

$$4.5 \quad 4.5$$

$$3.87 = x$$

This happens after 3.87 minutes.

$$b) \quad 17.4 + 8.7(3.87) \approx 13.2(3.87)$$

$$17.4 + 33.7 \approx 51$$

$$51 \approx 51$$

Yes it will have overflowed as there is about 102 L of water in the tub.

$$9. \quad \begin{cases} n + q = 10 \\ 5n + 25q = 170 \end{cases}$$

$$\begin{array}{r} 5n + 25q = 170 \\ -5n + 5q = 50 \\ \hline 20q = 120 \\ 20 \quad 20 \end{array}$$

$$q = 6$$

$$n + 6 = 10$$

$$n = 4$$

$$n = 10 - 6$$

There are 6 quarters and 4 nickels.  
Check  
 $6 \times .25 + 4 \times 0.05 = 1.70$   
 $1.50 + .20 = 1.70 \quad \checkmark$

$$10. \quad \begin{cases} x + y = 12 \\ x - y = 8 \end{cases}$$

$$2x = 20$$

$$x = 10$$

$$\begin{aligned} x + y &= 12 \\ 10 + y &= 12 \\ y &= 2 \end{aligned}$$

Then  $2x - xy = 2(10) - 10 \times 2 = 20 - 20 = 0$

The value of  $2x - xy$  is 0.

$$11. \quad \begin{cases} r + g = 1787 \\ 4r + 3g = 5792 \end{cases}$$

There were 431 reserved seats and 1356 general admission.

$$\begin{array}{r} 4r + 3g = 5792 \\ -r + g = 1787 \\ \hline 3r + 3g = 5361 \end{array}$$

$r = 431$

12. Upstream 40m/min Downstream 26m/min

Distance is the same.

∴  $33 \text{ m/minute}$

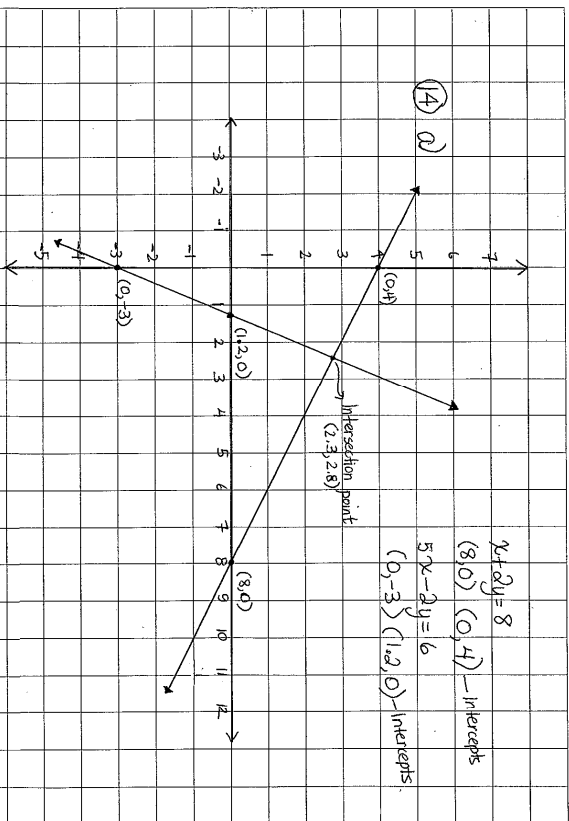
a) They move through the water at  $33 \text{ m/minute}$ .

b) The current is going  $40 \text{ m/min} - 33 \text{ m/min} = 7 \text{ m/min}$  or  $33 \text{ m/min} - 26 \text{ m/min} = 7 \text{ m/min}$

13. Gertrude can shovel the whole driveway in 40 min. She can shovel  $\frac{1}{2}$  the driveway in 20 minutes. She can shovel  $\frac{1}{4}$  of the driveway in 10 min. Therefore in 30 minutes she can shovel  $\frac{3}{4}$  of the driveway. ( $\frac{1}{2} + \frac{1}{4}$ )

When they worked together for 30 minutes, Gertrude shoveled  $\frac{3}{4}$  of the driveway and Bertha shoveled  $\frac{1}{4}$  of the driveway. If Bertha shoveled  $\frac{1}{4}$  of the driveway in 30 min it would take her 2 hours to shovel the whole driveway.

Answer: 2 hours



b) Intersection point  $(2.3, 2.8)$

$$\begin{aligned} \text{c) } & x + 2y = 8 & x + 2.83 \cdot 2 &= 8 \\ & 5x - 2y = 6 & x + 5.6 &= 8 \end{aligned}$$

$$\begin{aligned} & \rightarrow 5x + 10y = 40 & x &= 2.3 \\ & -12y = -34 & & \\ & -12 & & \end{aligned}$$

$$\begin{aligned} & y = 2.83 & (2.3, 2.83) & \end{aligned}$$

d) Graphically I found the intersection point to be  $(2.3, 2.8)$ . That is very close to the actual solution I found when I solved the system by subtraction  $(2.3, 2.83)$ .