

147 total 1

Name: _____

Student # Solution r

MATH 161

TEST #3: EQUATIONS

Basic Algebra	/12	Algebra Translation	/12	Word Problems	/11	Application Word Problems	/12
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First Line Solution

1. $(n+1) + (n+2) + (n+3) = 10 + 2(n+1)$. Find the value of n . [3 points]

$$\begin{aligned}
 3n + 6 &= 10 + 2n + 2 \\
 n &= 10 + 2 - 6 \\
 &= 12 - 6 \\
 &= 6
 \end{aligned}$$

2. $T = 1/a + t$. Solve for a : [3 points]

$$\begin{aligned}
 T &= \frac{1}{a} + t \\
 a \times (T - t) &= \frac{1}{\cancel{a}} \times a \\
 \frac{a(T-t)}{\cancel{(T-t)}} &= \frac{1}{\cancel{(t-t)}} \\
 a &= \frac{1}{T-t}
 \end{aligned}$$

3. The volume of a cylinder is $V = \pi r^2 h$. Solve for r .

[3 points]

$$\frac{V}{\pi h} = \frac{\pi r^2 h}{\pi h}$$

$$\sqrt{r^2} = \sqrt{\frac{V}{\pi h}}$$

$$r = \sqrt{V/\pi h}$$

4. $T = \sqrt{\frac{2d}{g}}$. Solve for g :

[3 points]

$$T = \sqrt{\frac{2d}{g}}$$

$$\times g \quad T^2 = \frac{2d}{g}$$

$$\frac{gT^2}{T^2} = \frac{2d}{T^2}$$

$$g = \frac{2d}{T^2}$$

5. Translate into an equivalent algebraic expression. Solve if specified.

(a) The sum of three consecutive numbers is 12 more than the second number. What are the three numbers?

[4 points]

$$(x) + (x+1) + (x+2) = 12 + (x+1)$$

$$3x + 3 = 12 + (x+1)$$

$$2x = 10 - 3$$

$$\frac{2x}{2} = \frac{10-3}{2} \quad x = \frac{7}{2}$$

\therefore 

\therefore 1, 6, 7

(b) The squares of three consecutive odd numbers total 8 more than 9 times the sum of the 3 numbers.

[3 points]

$$(2x+1)^2 + (2x+3)^2 + (2x+5)^2 = 8 + 9[(2x+1) + (2x+3) + (2x+5)]$$

(c) If the largest of 3 consecutive even numbers is subtracted from the sum of the other two, the result equals half the largest number. Find the numbers. [4 points]

$$2x, 2x+2, 2x+4$$

$$(2x+2) + (2x) - (2x+4) = \frac{1}{2}(2x+4)$$

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

$$x = 4$$

8, 10, 12 being largest.

6. How much of a 15% solution of alcohol and a 40% solution of alcohol must be mixed to give 50 L of a solution containing 25% alcohol? Use either the substitution method or the elimination method. [7 points]

Let A be solution
^ first

Let B be second solution

$$\textcircled{1} A + B = 50 \text{ Litres.}$$

$$\textcircled{2} 0.15A + 0.4B = 0.25(50)$$

0.15 x ①

$$\begin{array}{r} 0.15A + 0.15B = (0.15)(50) \\ - \textcircled{2} \quad 0.15A + 0.4B = 12.5 \\ \hline -0.3B = -5 \end{array}$$

$$B = \frac{-5}{-0.3} = 16.7 \text{ Litres.}$$

Sub into ① $A + 16.7 = 50$
 $A = 50 - 16.7 = 33.3 \text{ Litres}$

$$A = 16.7 \text{ L needed}$$

$$B = 33.3 \text{ L needed.}$$

7. The following equations represent a system of forces that are acting on a structure that is in equilibrium. Find the forces F_1 and F_2 , using either the substitution method or the elimination method. [5 points]

$$\textcircled{1} F_2 \sin 73^\circ - F_1 \sin 85^\circ = 0$$

$$\textcircled{2} F_2 \cos 73^\circ - F_1 \cos 85^\circ - 6 = 0$$

substitution method $F_2 = \frac{F_1 \cdot 0.996}{0.956}$ ① sub into ②

$$\textcircled{2} [F_1(1.04)] \cos 73^\circ - F_1 \cos 85^\circ - 6 = 0$$

$$0.30 F_1 - 0.08 F_1 = 6$$

$$0.22 F_1 = 6$$

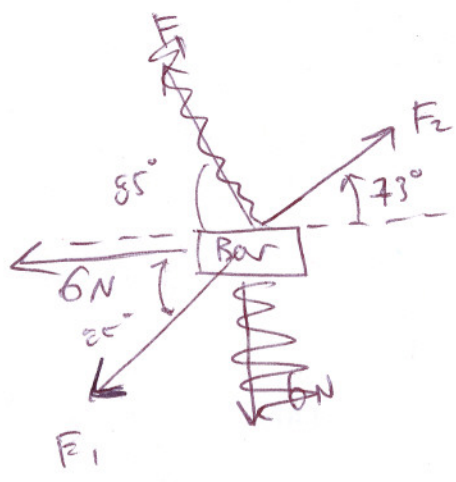
$$F_1 = 28.3$$

Sub into ① or ②, pick ①

$$0.96 F_2 - 28.2 = 0$$

$$0.96 F_2 = 28.2$$

$$F_2 = 29.4$$



Bonus Question [+2 Points]

- The scalene triangle is thumbs rule in all aspects of forming a Japanese bonsai tree. What are the angles inside the triangle if the smallest angle is 2° more than $\frac{3}{4}$ of the middle angle and the largest is 12° less than 3 times the middle angle?

[Hint 1: let A, B, and C be the variables for the smallest, middle and largest angles respectively]

[Hint 2: Since you have 3 unknowns (i.e. A, B, and C) you must include a third equation. Ask yourself: what would be the sum of the internal angles A, B, and C of any triangle?]

Let: A small Δ
 B median Δ
 C large Δ

① $A = 2^\circ + \frac{3}{4}B$

② $C = 3B - 12^\circ$

③ $A + B + C = 180^\circ$

substitution method

sub $A = 2^\circ + \frac{3}{4}B$ into ③

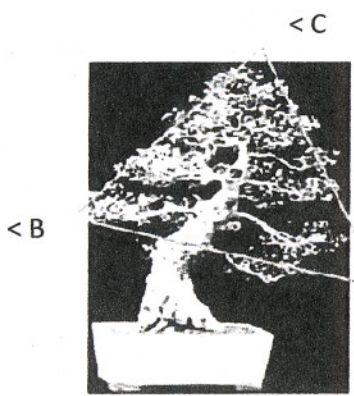
sub $C = 3B - 12^\circ$ into ③

$$\left(2^\circ + \frac{3}{4}B\right) + B + (3B - 12^\circ) = 180^\circ$$

$$\frac{4.75B}{4.75} = \frac{180 + 10}{4.75}$$

$B = 40^\circ$ sub into ②

back. \rightarrow



$$C = 3B - 12^\circ$$

$$C = 3(40) - 12^\circ$$

$$C = 120^\circ - 12^\circ$$

$$C = 108^\circ$$

∴ b $C = 108^\circ$ & $B = 40^\circ$ into (3)

$$A + 108^\circ + 40^\circ = 180^\circ$$

$$A = 180 - 108 - 40^\circ$$

$$A = 32^\circ$$

$$\begin{aligned} A &= 32^\circ \\ B &= 40^\circ \\ C &= 108^\circ \end{aligned}$$

