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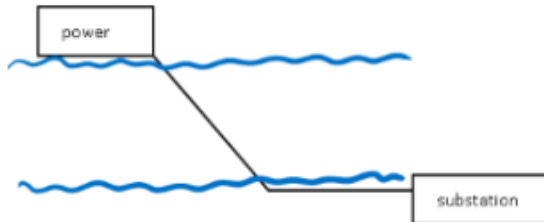
Word Problems

Linear

1. A motor boat travels 400km. If the boat went 18km/h faster, it could have travelled 600km in the same amount of time. What was the original speed of the boat?

2. A merchant has 5 pounds of mixed nuts that cost $30. He wants to add peanuts that cost $1.50 per pound and cashews that cost $4.50 per pound to obtain 50 pounds of a mixture that costs $2.90 per pound. How many pounds of peanuts are needed?

Quadratic

3. A power plant is located on the bank of a river that is 0.5 mile wide. Wiring is to be laid across the river and then along the shore to a substation 8 miles downstream, as shown in the diagram. It costs $12000 per mile for underwater wiring and $8000 per mile for wiring on land. If $72000 is to be spent on the project, how far from the substation should the wiring come to shore?

4. When a basketball team charges $4 per ticket, average attendance is 500 people. For each 20¢ decrease in ticket price, average attendance increases by 30 people. What should the ticket price be to ensure maximum income?

1

<u>Trig</u>

5. A 5.2 m ladder leans against a wall. The bottom of the ladder is 1.9 m from the wall. What angle does the ladder make with the ground (to the nearest degree)?

6. To calculate the height of a tree, Marie measures the angle of elevation from a point A to be 34°. She measures her distance to be 8 m from the base of the tree. How high is the tree to the nearest tenth of a metre?

7. The CN Tower was once the world's tallest freestanding structure. From a certain point, the angle of elevation of the top of the tower is 65 degrees. From a point 56.6m closer, the angle of elevation of the top of the tower is 70 degrees. Calculate the height of the tower.

8. Two airplanes leave an airport, and the angle between their flight paths is 40°. An hour later, one plane has traveled 300 miles while the other has traveled 200 miles. How far apart are the planes at this time?

9. An apartment building is 500 m high. It casts a shadow 600 m long. The shadow of a neighbouring building is 900 m long. How tall is the neighbouring building?

2

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Handwritten solutions:

(1.) $T = \frac{D}{V}$ $\frac{400}{V} = \frac{600}{V+18}$

cross mult
$400(V+18) = 600V$
$400V + 7200 = 600V$
$7200 = 200V$
$36 = V$

∴ 36 km/h is the original speed
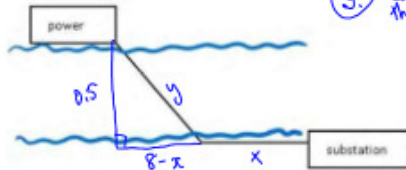
(2.)

	kg	Rate	Cost
peanuts	p	1.50	1.50 p
cashews	c	4.50	4.50 c
Total	50		2.90(50) = 145

$p + c = 50$ ①
$1.50p + 4.50c = 145$ ②
$1.50p + 1.50c = 75$
$0p + 3c = 70$
$c = 23.3$
$p = 26.7$

∴ 26.7 pounds of peanuts are needed.

(3.) Cost in thousands

$12y + 8x = 72$ sub $y = \frac{72 - 8x}{12} = 6 - \frac{3x}{3}$
$0.5^2 + (8-x)^2 = y^2$
$0.25 + 64 - 16x + x^2 = 36 - 8x + \frac{4}{9}x^2$
$\frac{5}{9}x^2 - 8x + 28.25 = 0$
$x = 8 \pm \frac{\sqrt{1.22}}{1.11}$ $x = 8.2$ can't be
$x = 6.2$ ∴ at 6.2 miles from substation.

$Rev = price \times quantity$ let $x = \#$ of times decrease by 20¢
$Rev = (4 - 0.20x)(500 + 30x)$

max at vertex ~ middle of zeros $x = 20$ and $x = -16.67$
(v, w) $x = v = \frac{20 + -16.67}{2} = 1.67$

$R = w = (4 - 0.20(1.67))(500 + 30(1.67))$
$Rev = (3.67)(550) = \$2016.67$
price quantity

→ check price higher than 3.67
price 3.8 ie. $x = 1$
$Rev = (3.8)(500 + 30(1)) = 2014$

→ check price lower
price 3.6 ie. $x = 2$
$Rev = (3.6)(500 + 30(2)) = 2016$
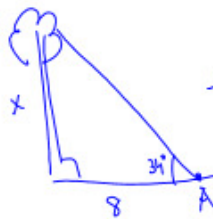
∴ price of 3.67 will make max $Rev = \$2016.67$

is MAX!

5

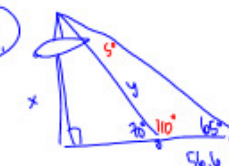**Trig**

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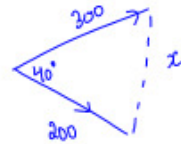
(5.)

$$\cos X = \frac{1.9}{5.2}$$
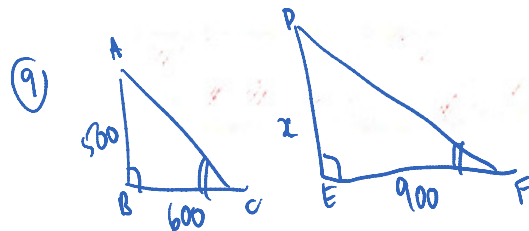$$X = \cos^{-1}\left(\frac{1.9}{5.2}\right)$$
$$X \doteq 69°$$

(6.)

$$\tan 34 = \frac{x}{8}$$
$$8(\tan 34) = x$$
$$5.4_m \doteq x$$

(7.)

$$\frac{\sin 5°}{56.5} = \frac{\sin 65}{y}$$
$$y = \left(\frac{\sin 65}{\sin 5}\right) 56.5$$
$$y \doteq 587.5$$

$$\sin 70 = \frac{x}{y}$$
$$\sin 70 = \frac{x}{587.5}$$
$$587.5(\sin 70) = x$$
$$552.1 \doteq x$$

∴ height of CN tower is 552.1 m

(8.)

$$x^2 = 300^2 + 200^2 - 2(300)(200)\cos 40°$$
$$x^2 \doteq 38074.6$$
$$x \doteq 195.1 \text{ miles apart}$$

(9.)

$$\triangle ABC \sim \triangle DEF$$

$$\frac{AB}{DE} = \frac{BC}{EF}$$

$$\frac{500}{x} = \frac{600}{900}$$

$$450000 = 600x$$

$$750 = x \quad \text{∴ building is 750 m tall}$$