

1.  $\Delta JQW$ : Law of Sines to find  $m \overline{QW}$

①

$$\frac{x}{\sin 35^\circ} = \frac{80}{\sin 128^\circ}$$

$$x \cdot \sin 128^\circ = 80 \sin 35^\circ$$

$$x = \frac{80 \sin 35^\circ}{\sin 128^\circ}$$

$$x = 58.23 \text{ cm}$$

$\Delta WQR$ : Find  $m \overline{WR}$   
(right  $\Delta$ )

$$\cos 31^\circ = \frac{\text{adj}}{\text{hyp}} = \frac{58.23}{y}$$

$$\cos 31^\circ = \frac{58.23}{y}$$

$$y = \frac{58.23}{\cos 31^\circ}$$

$$y = 67.93 \text{ cm}$$

$\Delta TRS$ : Find  $m \overline{RT}$   
(right  $\Delta$ )

$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\tan 54^\circ = \frac{z}{47}$$

$$z = 47 \tan 54^\circ$$

$$z = 64.69 \text{ cm}$$

$\Delta WTR$   
(right  $\Delta$ )

$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\sin \theta = \frac{64.69}{67.93}$$

$$\sin \theta = 0.95226$$

$$\theta = m \angle RWT = \sin^{-1}(0.95226)$$
$$= 72.22^\circ$$

$$= \underline{72.2^\circ}$$

2. weakest = 0.42  
strongest = -0.70

} Answer: 3, 1, 2



3. Period = 60 minutes

165 - 60 = 105 minutes  
on the graph

at 105 minutes, distance is 1.25 km  
 $\therefore$  at 165 it will also be at 1.25 km

Answer: **B**

4. weakest = -0.42 > 2, 3, 1      Answer: **C**  
 strongest = -0.82

5. weakest = 1 > 1, 3, 2      Answer: **B**  
 strongest = 2

6.  $\Delta VSN$  : Find  $m \overline{SN}$        $\tan 78^\circ = \frac{x}{170}$   
 $x = 170 \cdot \tan 78^\circ$   
 $x = 799.79 \text{ cm}$

$\Delta QFN$  : Find  $m \overline{QN}$        $\cos 54^\circ = \frac{333}{y}$   
 $y = \frac{333}{\cos 54^\circ}$   
 $y = 566.53 \text{ cm}$

$\Delta RQN$  : Law of Sines to find  $m \overline{RN}$   
 $\frac{566.53}{\sin 48^\circ} = \frac{z}{\sin 110^\circ}$   
 $z \cdot \sin 48^\circ = 566.53 \cdot \sin 110^\circ$   
 $z = \frac{566.53 \cdot \sin 110^\circ}{\sin 48^\circ}$   
 $z = 716.37 \text{ cm}$

$\Delta SRN$  : find  $m \angle NSR$        $\sin \theta = \frac{716.37}{799.79}$   
 $\sin \theta = 0.895702$   
 $m \angle NSR = \theta = \sin^{-1}(0.895702)$   
 $= \underline{63.6^\circ}$

7.

Period = 55 minutes

(3)

270 minutes is not on the graph: work backwards

$$270 - 55 = 215$$

$$215 - 55 = 160$$

$$160 - 55 = \underline{105} \Rightarrow 105 \text{ is on the graph}$$

$$x = 105$$

$$y = 0.5$$

∴ Answer: At 270 minutes, the height of the water is 0.5m

8.

1. Find side length of Clara's deck. using  $f(x)$ 

given:  $f(x) = 178.20$

$$178.20 = 8.8x^2$$

$$\frac{178.20}{8.8} = \frac{8.8x^2}{8.8}$$

$$20.25 = x^2$$

$$\sqrt{20.25} = x$$

$$\pm 4.5 = x$$

$$\therefore x = 4.5 \text{ m}$$

2. Find parameter  $a$  in  $g(x)$ , knowing  $x = 4.5$ 

$$g(x) = 283.50$$

$$283.50 = a(4.5)^2$$

$$283.50 = a(20.25)$$

$$\frac{283.50}{20.25} = \frac{20.25a}{20.25}$$

$$14 = a$$

$$\therefore g(x) = 14x^2$$

3. Find side length of Jacob's deck using  $g(x)$ 

$$143.36 = 14x^2$$

$$\frac{143.36}{14} = \frac{14x^2}{14}$$

$$10.24 = x^2$$

$$\sqrt{10.24} = x$$

$$\pm 3.2 = x$$

$$\therefore x = 3.2 \text{ m}$$

continue...

8 4. Length of Victor's deck =  $3.2 + 1.8 = 5\text{m}$  (4)

5. Find cost of varnishing Victor's deck using  $f(x)$

$$f(5) = 8.8(5)^2$$

$$f(5) = 8.8(25)$$

$$f(5) = 220$$

Answer The cost of varnishing Victor's deck is \$220.

9. Town F: find the number of years since the move

Knowing  $f(x) = 13\,122$

$$13\,122 = 20\,000(0.9)^x$$

Guess and Check

$x$	$y$
2	$20\,000(0.9)^2 = 16\,200$
3	$20\,000(0.9)^3 = 14\,580$
4	<u>13\,122</u>

$\therefore$  The move was 4 years ago.

Town G: starting population same as Town F

$$\therefore a = 20\,000$$

$$\text{growth of } 15\% \Rightarrow c = 1 + 0.15 = 1.15$$

$$\text{Equation for Town G } g(x) = 20\,000(1.15)^x$$

We know  $x$  (time) = 4 years

$$\begin{aligned} \therefore \text{Population of Town G today} &\Rightarrow g(4) = 20\,000(1.15)^4 \\ &= 34\,980.125 \\ &\approx 34\,980 \end{aligned}$$

Town G's population grew by  $34\,980 - 20\,000 = \underline{14\,980}$

Answer: 14\,980 people