

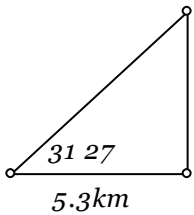
2009 Trigonometry Applications (Alpha)

1. $\omega = \frac{120 \text{ rev}}{\text{min}} \cdot \frac{2\pi \text{ rad}}{1 \text{ rev}} \cdot \frac{1 \text{ min}}{60 \text{ sec}} = 4\pi \text{ rad/sec} = 12.6 \text{ rad/sec. A}$

2. $V = lw \rightarrow 7\text{cm}(4\pi)\text{rad/sec} = 28\pi \text{ cm/sec} = 87.9 \text{ cm/sec. C}$

3. $\tan \alpha = \frac{5}{33}; \angle \alpha = 8.6^\circ. \mathbf{B}$

4. $H = \tan 31 \left(\frac{27}{60} \right) 5.3 \rightarrow h = 3.2 \text{ km. B}$



5. $X = \frac{5.3}{\cos(31.45)} \rightarrow x = 6.2 \text{ km. E}$

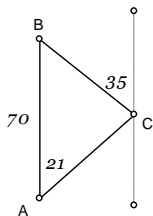
6. $\tan^{-1} \frac{50}{5.3} = 83.9^\circ. \mathbf{A}$

7. $\frac{\sin A}{49.8} = \frac{\sin 33.7}{36.2} = \frac{\sin C}{c} \rightarrow m\angle a = 49.8 \text{ or } 130.2 \text{ and } m\angle c = 96.5 \text{ and } 16.1 \rightarrow c = \frac{36.2 \sin 96.5}{\sin 33.7} = 64.8, \text{ or}$
 $c = \frac{36.2 \sin 16.5}{\sin 33.7} = 18.5. \mathbf{E}$

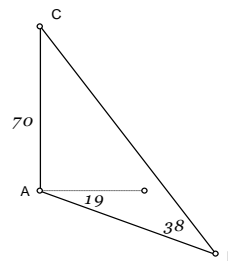
8. Rt. Triangle = $\frac{1}{2}(5)(12) = 30. \mathbf{B}$

9. $100 = 49 + 16 - 56 \cos c \rightarrow \cos c = -\frac{35}{56}, m\angle c = 128.7^\circ$ and in the same manner: $m\angle D = 33.1$ and $m\angle E = 18.2. \mathbf{E}$

10. $m\angle bca = 124^\circ; \frac{\sin 124}{70} = \frac{\sin 21}{x} \rightarrow x = 30.3, \frac{\sin 124}{70} = \frac{\sin 35}{y} \rightarrow y = 48.4; 78.7 - 70 = 8.7 \text{ km. A}$

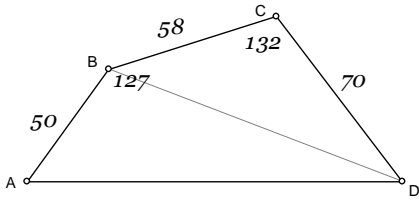


11. $m\angle bca = 33^\circ; \frac{\sin 33}{x} = \frac{\sin 38}{70} \rightarrow x = 61.9,$
 $\frac{\sin 109}{y} = \frac{\sin 38}{70} \rightarrow y = 107.5; 169.4 - 78.7 = 90.7 \text{ km. C}$



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12. Area of $\triangle BCD = \frac{1}{2}(58)(70)\sin 132 = 1509$; $bd^2 = 58^2 + 70^2 - 2(5)(70)\cos 132$; $bd = 117$;
 $\frac{\sin 132}{117} = \frac{\sin \angle CBD}{70}$



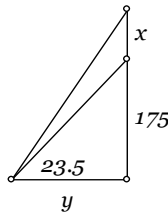
$m\angle CBD = 26$, $m\angle ABD = 101$;
 Area $\triangle ABD = \frac{1}{2}(50)(117)\sin 101 = 2871$.
 Area of $abcd = 2871 + 1509 = 4380$. **C**

13. $Ad^2 = 50^2 + 117^2 - 11700\cos(100.6) \rightarrow ad = 135$. **B**

14. $\frac{\sin A}{117} = \frac{\sin 100}{135}$; $m\angle A = 59$; $m\angle ADC = 42$. **C**

15. Amp = $\frac{40.4-37}{2} = 1.7$; period = $\frac{2\pi}{16} = \frac{\pi}{8}$, $t(t) = 38.7 + 1.7[\sin(\pi t/8)]$, $38.7 + 1.7[\sin 1.5\pi] = 37^\circ$ **A**

16. $\tan 23.5 = 175/y$; $y = 402$,
 $\tan 28.3 = (x + 175)/402$
 $402 \tan 28.3 - 175 = 15.8 \text{ ft.}$ **C**

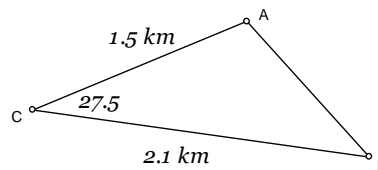


17. $\cos \theta = \frac{2(-3)+(-3)(-5)}{\sqrt{4+9}\sqrt{9+25}} = \frac{9}{\sqrt{13}\cdot 34}$; $\cos^{-1} \frac{9}{\sqrt{13}\cdot 34} = 64.7^\circ$ **E**

18. $300 = \frac{1}{32}(100)^2 \sin 2\theta$; $2\theta = \sin^{-1} \left(\frac{24}{25}\right) = 73.7$; $\theta = 36.9^\circ$, **E**

19. $300 = \frac{1}{32} v_0^2 \sin 18^\circ$; $v_0^2 = \frac{9600}{\sin 18}$; $v_0 = 276 \text{ ft/sec.}$ **B**

20. $AB^2 = 1.5^2 + 2.1^2 - 2(1.5)(2.1)\cos 27.5$, $AB = 1.0$
 $RT = 1.5 + x = 2.1 + 1.0 - x$; $2x = 1.6$, $x = .8 \text{ km.}$ **D**



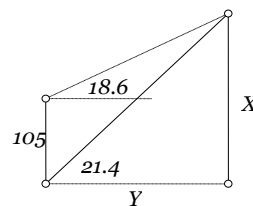
21. $d^2 = 4 + 25/4 - 2(2)(5/2)\cos 60$; $d = 2.3 \text{ km.}$ **B**

22. $d^2 = 215^2 + 345^2 - 2(215)(345)\cos 19$; $d = 158 \text{ ft.}$ **E**

23. $169 = 16 + 100 - 80 \cos x$; $x = 132^\circ$. **D**

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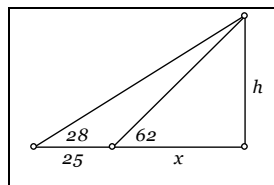
24. $\frac{\sin 2.8}{105} = \frac{\sin 108.6}{h}$; $h = 2037.2 \text{ ft}$, $\sin 21.4 = x/2037.2$;
 $x = 743.3 \text{ ft}$. **D**



25. $Y = 743.3 / \tan 21.4 = 1896.7 \text{ ft}$. **E**

26. $\sin(3\pi/2) = -1$, will give the largest value. **C**

27. $\tan 62 = h/x$; $x = h/\tan 62$; $\tan 28 = h/(25 + x)$;
 $h = 18.5$. **D**



28. For $t(t)$ to be greatest: $t - 4 = 12$, $t = 16$. **E**

29. When $t = 16$, $t(t) = 91^\circ$. **B**

30. $y = -2\sin(2x) - \cos(x)$. **D**

Tie-breakers:

1. $90 - 12 = 78$. $180 - 142 = 38^\circ$; $\frac{\sin 64}{x} = \frac{\sin 38}{34}$, $x = 50$

2. $d^2 = 165^2 + 80^2 - 2(165)(80) \cos 65$; $d = 150 \text{ miles}$.

