Solutions

6.1 Sine, Cosine and Tangent (d) Solutions

1. (i)35m
   (ii)61m
2. $\alpha = 68.2°$, $\beta = 59°$
3. (i)30m (ii)71.57°

6.2 Sine/Cosine rule in context Solutions

1. (i) 613m
   (ii) 449m
   (iii) 142 seconds
   (iv) 579m
   (v) 104 seconds.
2. (i) 147km
   (ii) 175km
3. (i) $(2x)^2 = (x+2)^2$.... (ii) $x = 1.54$, take the positive answer as x is a positive distance.

6.3 3D Trigonometry Solutions

1. $x = 10$, $y = 10\sqrt{2}$
2. $|BC| = \sqrt{2}$, $AC = \sqrt{3}$
3. (i) $x = 10.28$m.
   (ii) $\alpha = 84°$.
4. (i) $|AB| = 200$m.
   (ii) $|DB| = 236.6$m.
   (iii) $|AD| = 275.66$m.

6.4 Trigonometric Identities Solutions

13. (a) $\frac{56}{65}$
    (b) $\frac{63}{65}$
14. $h = 6$
15. No solution given.
16. $|< PRQ| = 120°$
17. $\theta = 30°$

6.5 Trigonometric Equations Solutions

1. i. $30°$ or $150°$
   ii. $30°$ or $330°$
   iii. $45°$ or $225°$
   iv. $150°$ or $210°$
   v. $120°$ or $300°$
   vi. $60°$ or $120°$
   vii. $120°$ or $240°$
   viii. $45°, 135°, 225°$ or $315°$
   ix. $30°, 150°, 210°, 330°$
2. i. $15°, 75°, 195°, 255°$
   ii. $50°, 110°, 170°, 230°, 290°, 350°$
   iii. $22.5°, 157.5°, 202.5°, 337.5°$
   iv. $112.5°, 157.5°, 292.5°, 337.5°$
   v. $0°, 60°, 120°, 180°, 240°, 300°$
   vi. $45°, 135°, 225°, 315°$

6.6 Trig Functions

1. (a) Range: $[-3, 3]$ Period: 2π
   (b) Range: $[-1, 1]$ Period: π
   (c) .

(d) $h(x) = 2\sin(4x)$

2. (a) $f(x) = \sin(2x)$
   (b) $a = \frac{\pi}{6}, b = \frac{\pi}{3}, c = \frac{7\pi}{6}, d = \frac{4\pi}{3}$

3. (a) $f(x) = 2\cos(x)$
   (b) $a = \frac{4\pi}{3}, b = \frac{8\pi}{3}, c = \frac{14\pi}{3}, d = \frac{16\pi}{3}$

6.7 Exam Questions

1. **2016**
   (a) i. Proof
   ii. Proof
   iii. 3 m
   iv. 65°
   v. 15 m^2
   (b) $\sqrt{6}$ m

2. (a) Period: 12 hours
   Range: [0.1, 3.1]m
   (b) 3.1 m
   (c) -0.68 m/hr
   Height of water is decreasing at a rate of 0.68 m/hr at $t = 2$.
   (d) i.

$h(t) = 1 \cdot 6 + 1 \cdot 5\cos\left(\frac{\pi}{6}t\right)$									
Time	12 am	3 am	6 am	9 am	12 pm	3 pm	6 pm	9 pm	12 am
t	0	3	6	9	12	15	18	21	24
Height	3·1	1·6	·1	1·6	3·1	1·6	·1	1·6	3·1

   ii. Graph
   (e) 3 m
   (f) 5.5 hours

3. Proof

4. $\cos\theta = \pm\frac{\sqrt{5}}{3}$

2015

5. (a) Proof
   (b) $x = 20°, 40°, 140°, 160°, 260°, 280°$

6. (a) 20 cm
   (b) 8000 cm^2
   (c) i. 138.9°

ii. 28833 cm^2

7. (a) 11.5°

(b) 213 m

(c) i. 8m

ii. 3°

(d) i. $d = 2h$
$|CD| = 25 - h$

ii. 10m

2014

8. (a) i. 72.15°

ii. 7653 m^2

(b) $\triangle AED, \triangle BED$ and $\triangle CED$ are congruent by S.A.S.

9. (a) Proof

(b) $\theta = 2.5$ radians

10. (a) i. (-311, 311 points)

ii. 50 periods per second

t	t_1	t_2	t_3	t_4	t_5	$t_6 = 0.01$	t_7	t_8	t_9	t_10	t_11	$t_12 = 0.02$
V	156	269	311	269	156	0	-156	-269	-311	-269	-156	0

(b) i.

ii. Standard Deviation = 220

(c) i. $k = 1.414$

ii. $b = 120\pi$

11. i. .

ii. If r_1 is the radius of t, r_2 is the radius of s, and r_3 is the radius of u, then $(2r_1)^2 + (2r_2)^2 = (2r_3)^2$
Now show: $\pi r_1^2 + \pi r_2^2 = \pi r_3^2$

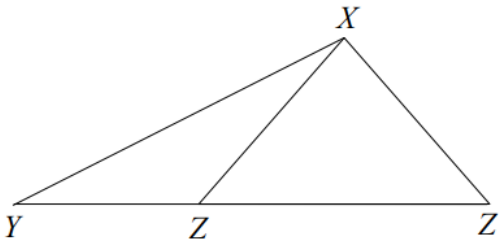
iii. Use $\frac{\pi r_1^2}{2} + \frac{\pi r_2^2}{2} = \frac{\pi r_3^2}{2}$

2013

12. (a) Proof

(b) i. 49° or 131°

ii.



(c) 104°, 7 cm^2

13. (a) $k = 4\sqrt{2}$

(b) i. Perimeter $= 2\pi r_1$, using $r_1 = r_2 + r_3$

ii. Area of both shapes is 8π

r_1	r_2	r_3	Area of arbelos
6	1	5	5π cm^2
6	2	4	8π cm^2
6	3	3	9π cm^2
6	4	2	8π cm^2
6	5	1	5π cm^2

(c) i.

ii. $\pi(6x - x^2)$ cm^2

iii. 9π cm^2

(d) Proof

2012

14. (a) $\alpha = 44°$, $\beta = 100°$

(b) α

(c) More sensitive to changes in α when $|PR| > 12$.
More sensitive to changes in β when $|PR| < 12$

(d)

2014 Sample

15. (a) graph

(b) $(\frac{17\pi}{12}, \frac{1}{2})$

2011

16. 3500 km