1. 10

2. $20

3. $24\sqrt{3}$

4. –60

5. 2

6. 16,848

7. 19

8. $\sqrt{13}$

9. 555

10. 17

11. 34,560

12. $8i$

13. $36\sqrt{3}$

14. 40

15. 2,034,145

16. $\dfrac{65}{27}$

17. $\dfrac{3}{2}$

18. $\dfrac{12\sqrt{5}}{7}$

19. 131

20. 9

21. $\left(-2, -\dfrac{1}{3}\right]$

22. $\dfrac{\pi^2}{108}$

23. 202 hours, 22 minutes

24. 214,358,881

25. 8

1.

2+0+1+7=10

$12x5 = 60$

2. $60/10 = 6$

$6/3*10 = 20$

3. Apothem = $2\sqrt{3}$

Perimeter = 24

$A = \frac{1}{2}\left(2\sqrt{3}\right)(24) = 24\sqrt{3}$

4. $\left(\dfrac{(3c+13)+(7-c)}{2}, \dfrac{(d-5)+(d-1)}{2}\right)$

$= (c+10, d-3) \Rightarrow c = -6,\ d = 10$

$\Rightarrow cd = -60$

$.25(4) + x = .5(x+4)$

5. $.5x = 1$

$x = 2$

6. Determinant of

$\begin{vmatrix} 132 & -24 \\ -24 & 132 \end{vmatrix} = 132^2 - 24^2$

$= 17,424 - 576 = 16,848$

7. 13, 23, 30, 31, 32, 33, 34, 35, 36,

37, 38, 39, 43, 53, 63, 73, 83, 93 –

There are 19 3s

8. $x^2 + y^2 - 2x + 4y - 8 = 0$

$x^2 - 2x + 1 + y^2 + 4y + 4 = 8 + 1 + 4$

$(x-1)^2 + (y+2)^2 = 13$

$r = \sqrt{13}$

9. 2, 5, 7, 12, 19, 31, 50, 81, 131, 212,

343, 555

10. distance point to line y=0 is 17

11. $5!4!3!2!1! = 120 \cdot 24 \cdot 6 \cdot 2 \cdot 1 = 34,560$

12. $(1-i)^6 = (1 - 2i + i^2)^3$

$= (1 - 2i - 1)^3 = (-2i)^3 = 8i$

13. Apothem of $2\sqrt{3}$ means altitude

of $6\sqrt{3}$, which means a side of 12.

Area $= \dfrac{\left(12^2\sqrt{3}\right)}{4} = 36\sqrt{3}$

14. Find the radius of the circle

$A = 25\pi = \pi r^2$

$r = 5$

Side of the square=diameter of

$D = 2r = 2(5) = 10$

circle $P = 4D = 40$

Perimeter is 40.

15. $2017 = a^2 - b^2 = (a+b)(a-b)$

$a + b = 2017,\ a - b = 1$

$\Rightarrow a = 1009,\ b = 1008$

$a^2 + b^2 = 2,034,145$

16.

$$\frac{\frac{5}{3} \pm \sqrt{\left(\frac{5}{3}\right)^2 - 4(1)(\frac{4}{9})}}{2(1)} = \frac{\frac{5}{3} \pm \sqrt{\frac{25}{9} - \frac{16}{9}}}{2}$$

$$= \frac{\frac{5}{3} \pm \sqrt{\frac{9}{9}}}{2} = \frac{\frac{5}{3} \pm 1}{2} = \frac{\frac{5}{3} + \frac{3}{3}}{2} \text{ or } \frac{\frac{5}{3} - \frac{3}{3}}{2}$$

$$= \frac{4}{3} \text{ or } \frac{1}{3}$$

$$\left(\frac{4}{3}\right)^3 + \left(\frac{1}{3}\right)^3 = \frac{65}{27}$$

17.
$$x = 3y, \; z = 2w$$
$$\frac{x}{y} = \frac{3y}{y} = 3, \quad \frac{w}{z} = \frac{w}{2w} = \frac{1}{2}$$
$$\frac{xw}{yz} = \frac{x}{y} \cdot \frac{w}{z} = \frac{3}{2}$$

18.
$$y = 0 \Rightarrow x = -\frac{12}{7}$$
$$x = 0 \Rightarrow y = \frac{24}{7}$$
$$\sqrt{\left(-\frac{12}{7}\right)^2 + \left(\frac{24}{7}\right)^2} = \frac{12\sqrt{5}}{7}$$

19.

$$3x + 4x + 5x + 6x + 7x + 8x = 180(6 - 2) = 720$$
$$33x = 720$$

$$x = \frac{240}{11}$$
$$6x = \frac{1440}{11} = 130.909.... \approx 131$$

20. aaa, aao, aab, aoo, aob, abb, ooo,

oob, obb – 9 different fruit salads

21.

$$\frac{27 - 54x}{27x + 54} \geq 1 \Rightarrow \frac{27 - 54x - 27x - 54}{27x + 54} \geq 0$$
$$\frac{-27 - 81x}{27x + 54} \geq 0$$

sign analysis implies solution of $\left(-2, -\frac{1}{3}\right]$

22. $\dfrac{5\pi}{3} \cdot \dfrac{\pi}{180} = \dfrac{\pi^2}{108}$

23. $\dfrac{934 \cdot 13}{60} = 202\dfrac{22}{60}$

202 hours, 22 minutes

24.
$$11^8 = 121^4 = 14641^2$$
$$= 214{,}358{,}881$$

$$\frac{5}{14} = \frac{\binom{k}{2}}{\binom{n}{2}} = \frac{k(k-1)}{n(n-1)}$$

25. k or $k - 1$ must be a multiple of 5
$\Rightarrow$ first few possibilities for k are
$5, 6, 10, 11, ...$
$k = 5 \Rightarrow k(k-1) = 20 \Rightarrow n(n-1) = 56$
$\Rightarrow n = 8$ (n must be a positive integer)