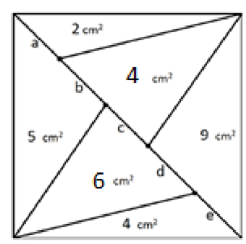
Answer Key

1. 12
2. $15 \div 3 = 5$ (side length of the square for pea)
   $5 - 3 = 2$ (side length before the change)
   $5 \times 2 = 10$ m^2
3. $2 : 3 = 6 : 9$
   $3 : 5 = 6 : 10$
   Total = 19
   Buddy: $6 + 6 = 12$
   Ans = $\frac{12}{19}$
4. $28 \div 2 = 14$
   $4 \div 2 = 2$
   $14 + 2 = 16$
   $14 - 2 = 12$
   $16:12 = 4:3$
5. The area of $\Delta BCD = \frac{9}{2}$.
   Each subsequent triangle becomes $\frac{1}{4}$ in area.
   So, the sum of all these areas is
   $1 + \frac{1}{4} + (\frac{1}{4})^2 + (\frac{1}{4})^3 + \ldots = S$
   $1 + \frac{1}{4}(1 + \frac{1}{4} + (\frac{1}{4})^2 + (\frac{1}{4})^3 + \ldots) = S$
   $1 + \frac{1}{4}S = S$
   $1 = \frac{3}{4}S$
   $S = \frac{4}{3}$
   $\frac{9}{2} \times \frac{4}{3} = 6$
6. Method I)
   Let d miles be the distance.
   Let x mph be the speed.
   $\frac{d}{x} = \frac{20}{60}$ …… ①
   $\frac{d}{x+18} = \frac{12}{60}$ … ②
   $\frac{①}{②} = \frac{x+18}{x} = \frac{20}{12} = \frac{5}{3}$
   $3x + 54 = 5x$
   $x = 27$
   $d = 27 \times \frac{1}{3} = 9$

   Method II)
   Let d be the distance in miles.
   His speed was $\frac{d}{\frac{1}{3}} = 3d$ mph.
   Now, with 18 mph faster, he can do it for 12 min ($\frac{1}{5}$ hr).
   $d = (3d + 18) \times \frac{1}{5}$
   $5d = 3d + 18$
   $2d = 18$
   $d = 9$ miles
7. 31

1		$13 = \frac{1}{2}(1+25)$		25
		$X = \frac{1}{2}(13+49)$		
17		$49 = \frac{1}{2}(17+81)$		81

8. D
   The largest triangle (half the square) has an area of 15 cm^2. All the triangles share the same height. So, the ratio of their bases is the ratio of their areas.
   $a = 2k$
   $b = 3k$
   $c = k$ (why?)
   $d = 5k$
   $e = 4k$



9. Had been there 2 more coins, no coin would be left over.
   LCM(6, 5) = 30
   In reality, we have to take 2 out.
   $30 - 2 = 28$
   28 mod 7 = 0 leftover
10. $5 \times 3 \times 4 = 60$ (original)
    $7 \times 3 \times 4 = 84$
    $5 \times 5 \times 4 = 100$
    $5 \times 3 \times 6 = 90$
    $6 \times 3 \times 5 = 90$
    $6 \times 4 \times 4 = 96$
    100 - 60 = <u>40</u>
11. $100 \times 40 = 4000$ (base area)
    $20^3 = 8000$
    $8000 \div 4000 = 2$ cm
12. GCF(180, 594) = 18
    $180 = 18 \times 10$
    $594 = 18 \times 33$
    LCM = $18 \times 10 \times 33$
    LCM:GCF = 330:1
13. A total of $c_2^6 = \frac{6 \times 5}{2 \times 1} = 15$ pairs.
    There are 5 pair with "0".
    $\frac{5}{15} = \frac{1}{3} = 1/3$

14. C
A:4 – π = 0.86
B:4 – π = 0.86
C:π - 2 = 1.14
C has the largest shaded region.

15. Method I)
40×17 = 680
20×15 = 300
15×16 = 240
680 – (300 + 240) = 140
140÷5 = 28

Method II) (advanced)
Let x be the average age of the adults.
40×17 = (20 + 15 + 5)×17 =
20×17 + 15×17 + 5×17 =
20×15 + 15×16 + 5x
20×2 + 15×1 = 5(x – 17)
8 + 3 + 17 = x
x = 28

16. The total area of 6 cubes:
6×6 = 36
There are five (5) connected faces.
So, the exposed area is
36 - 2×5 = 26

17. 201125 × 201224 × 201317
Focus on the following:
125×224 = 125×8×28 = 28000
There are 3 zeros at the end.

18. 6:HHTT (C_2^4 = 6)
4:HHHT
1:HHHH
So, the probability is $\frac{11}{2^4} = \frac{11}{16}$ = 11/16

19. 3Q = 75
1D = 10
3N = 15
2P = 2
And = 1 D &3 N

20. 13, 26, or 39, …
7, 14, 21, 28, 35, …
26 and 28 are closest to be good candidates.
Let consider:26, 27, 28
26 = 2×13
27 = 3^3
28 = 2^2×7
26×27×28 = $2^3 \cdot 3^3 \cdot 7 \cdot 13$
26 + 27 + 28 = 81

21. There must be 3 different numbers only. (Why?)
Let them be a, b, and c, in ascending order.
$a + b$ = 57 … ①
$a + c$ = 70 … ②
$b + c$ = 83 … ③
Sum them up.
2($a + b + c$) = 210
$a + b + c$ = 105 … ④
Consider ④ – ①
c = 48
b = 35 (3 occurrence)
a = 22

22. 1, 6, 12, 18
(6 + 18) – (1 + 12) = 11

23. 21 + 3 = 24 mod 6 = 0
Ans = 3 more cars

24. All primes are odd except 2, the only even prime.
Since there are two evens and one odd as visible,
59 must pair up with 2.
Now that 59 + 2 = 61 = 44 + 17 = 38 + 23
$\frac{1}{3}$(2 + 17 + 23) = 14

25. Let each side = 4 inches
The perimeter of a smaller rectangle:
2(4+1) = 10
The perimeter of the larger rectangle:
2(4 + 2) = 12
10:12 = 5:6

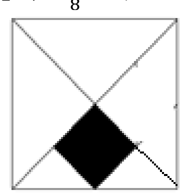
26. 7×2 = 14
19 – 14 = 5 (tricycles)

27. Case 3R:
4 cases:RRR, GRRR, RGRR, RRGR,
Case 2G
6 cases:GG, RGG, GRG, RRGG, GRRG, RGRG
$\frac{4}{10}$ = ⅖ = 2/5

28. 12×1.5 = 18
10 girls have one or two cupcakes.
18 – 10 = 8
8 girls have two cupcakes.

29. D

30. $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$ = 1/8

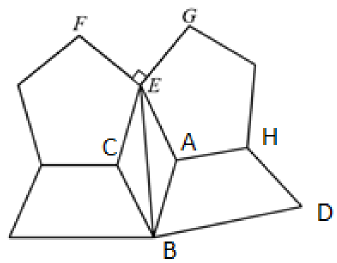


31. To be a 5-multiple, it must be ☐×5 or 5×☐.
There are
6 + 6 – 1 = 11 different pairs.
So, the probability is $\frac{11}{36}$ = 11/36

32. D
To be a multiple of another (with these four digits only),
the ones digit can be 5, 2, or 4.
The largest number is 7☐☐☐.
The smallest number is 2☐☐☐.
So, the multiple can be 2 or 3 times only.
7425 = 3×2475

33. $1\times1\times\ldots\times1\times3 = 3$
$1 + 1 + \ldots+3 = 2018$

34. $\angle AEC = 360\text{-}90\text{-}2\times108=54$
$\angle EAB = 180 - 54 = 126$
$\angle BAH = 360 - 126 - 108 = 126$
$\angle ABD = 180 - 126 = 54$



35. $12\div2 = 6$
$6\times\frac{3}{4} = 4.5$

36. Method I)
$4 - 1 = 3$ (gaps)
$60 \div 3 = 20$
$6 - 1 = 5$ (gaps)
$5\times20 = 100$

Method II) (Refinement)
$\frac{60}{4-1}\times(6-1) = 100$

37. A trapezoid consists of a rectangle and a triangle.
$6\times2 = 12$ (rectangle)
$\frac{1}{2}(6\times2) = 6$ (triangle)
$12 + 6 = 18$

38. D
Let x be the original number of candies.
Let a be the number of candies received by each child.
Left over by the 1st child: $\frac{1}{2}x - a$
Left over by the 2nd child: $\frac{1}{2}(\frac{1}{2}x - a) - a$
Received by the 3rd child: $\frac{1}{2}(\frac{1}{2}(\frac{1}{2}x - a) - a) = a$
$\frac{1}{2}(\frac{1}{2}x - a) - a = 2a$
$\frac{1}{2}(\frac{1}{2}x - a) = 3a$
$\frac{1}{2}x - a = 6a$
$\frac{1}{2}x = 7a$
$x = 14a$
It must be a 7-multiple, but not necessarily a 21-multiple.

39. $-14 + 2\times26 = 38$

40. A
$247 \bmod 8 = 7$
2 more moves from 5.