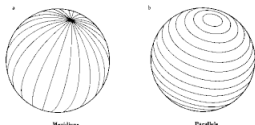
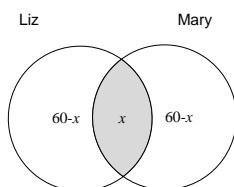


Answer Key

- $16 \div 2 = 8$
 $8 \times 4 = 32$ cm
- E
- 10 parallels (horizontal) divide a globe into 11 regions.
10 meridians (vertical) divide a globe into 10 regions.
 $10 \times 11 = 110$

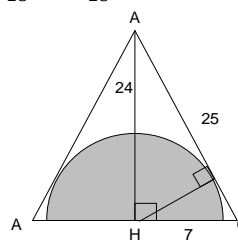


- If both solved the question, they earned a total of 5 points. If only one solved it, they earned a total of 4 points.
Let x be the number of questions solved by both.
So, the questions solved by either only is $60 - x$.
 $5x + 2(60 - x) \times 4 = 312$
 $480 - 3x = 312$
 $3x = 178$
 $x = 56$

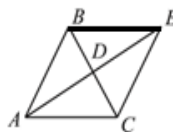


- $10 - 2 = 8$
 $12 - 2 = 10$
 $5 - 1 = 4$
 $10 \times 12 \times 5 - 10 \times 8 \times 4 = 280$
- $5 - 4 \times \frac{1}{8} = 4\frac{1}{2} = 4.5$ cm²
- 7
- $42 \div 3 = 14$
 $39 \div 3 = 13$
 $14 \times 13 = 2 \times 91 = 182$ sq yards
- 6 of them:
1. SPQSRQ
2. SPQRSQ
3. SQPSRQ
4. SQRSPQ
5. SRQSPQ
6. SRQPSQ
- $2.5 \times 7 = 17.5$ (Judi's share)
 $17.5 \times 8 = \$140$
- $300 \times 2 = 600$ sec = 10 min

- Let x be their original height.
Shea: $1.2x$
Ara: $1.1x$
 $60 \times \frac{1.1}{1.2} = 55$
- $a = b + 12$
 $\frac{1}{2}a = (b + \frac{1}{2}a) - 8$
 $b = 8$
 $a = 20$
 $a + b = 28$
- area($\triangle AHC$) = $\frac{1}{2} \times 7 \times 24 = \frac{1}{2} \times 25 \times R$
 $R = \frac{168}{25} = 6\frac{18}{25} = 6.72$



- $6 \times 4 \times 4 = 96$
 $4 \times 3 \times 3 = 36$
 $\frac{36}{96} = \frac{3}{8} = 37.5\%$
- $5^3 = 125$
 $3 \times 3 \times 4 = 36$
 $125 - 36 = 89$
- Since D bisects AE and BC, ABEC is a parallelogram.
 $BC = EC = AB = 11$
 $BD = \frac{1}{2} \times 11 = 5.5$ cm
- B
 $4 \times 7 = 28$
 $5 \times 6 = 10$
 $3 \times 8 = 24$
 $2 \times 9 = 18$
- 135°



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1	98	÷2	= 49	Ⓐ
2	49	-5	= 44	Ⓑ
3	44	÷2	= 22	Ⓐ
4	22	÷2	= 11	Ⓐ
5	11	-5	= 6	Ⓑ
6	6	×9	= 54	Ⓐ
7	54	÷2	= 27	Ⓐ
8	27	-5	= 22	Ⓑ
9	22	÷2	= 11	Ⓐ
10	11	-5	= 6	Ⓐ
11	6	×9	= 54	Ⓐ

20.

...

$$98^{\text{th}} = 93^{\text{rd}} = 88^{\text{th}} = \dots = 8^{\text{th}}$$

$$\text{Ans} = 22$$

21. total time = 2 hr 20 min = $2\frac{1}{3}$ hr

$$140 \div 2\frac{1}{3} = 60 \text{ mph}$$

22. Let the car run x gal in city, so it runs $15 - x$ on highway.

$$20x + 30(15 - x) = 400$$

$$450 - 10x = 400$$

$$10x = 50$$

$$x = 5 \text{ (mi in city)}$$

$$5 \times 20 = 100 \text{ (mi)}$$

23. $12 \div 3 + 12 \div 2 = 10$

$$24 \div 10 = 2.4 \text{ mph}$$

24. 1 min 20 sec = 80 sec

$$80 \times 20 = 1600$$

$$1600 - 200 = 1400 \text{ m}$$

25. $40 \pi \times 2640 \times 60 \div 12 = 528000 \pi$ feet per hour

$$528000 \pi \div 5280 = 100 \pi \text{ mph}$$

26. $0.5 \times 16 = 8$

$$1.5 \times 4 = 6$$

$$(8 + 6) \div (0.5 + 1.5) = \boxed{7 \text{ mph}}$$

27. C

$$\frac{2}{\frac{1}{10} + \frac{1}{20}} = \frac{40}{3} = 13.33$$

28. 4 min = $\frac{1}{15}$ hour

$$\text{speed} = \frac{\text{distance}}{\text{traveltime}} = \frac{2}{\frac{1}{15}} = \boxed{10 \text{ mph}}$$

29. Ann: $120 \times 3 / 36 = 10$

$$\text{Ben: } 420 / 14 = 30$$

$$10:30 = \boxed{1:3}$$

30. total time needed = $\frac{1}{3}$ hr

$$\frac{1/2}{2} = \frac{1}{4} \text{ hr}$$

$$\frac{1}{3} - \frac{1}{4} = \frac{1}{12} \text{ hr left}$$

$$\frac{1/2}{1/12} = \frac{12}{2} = \boxed{6 \text{ mph}}$$

31. $35 + 45 = 80$ mph (combined speed)

$$\frac{6}{3600} \times 80 = \frac{1}{600} \times 80 \times 5280 = \boxed{704 \text{ ft}}$$

32. $2 \times 8 = 16$ mi

$$1 \text{ hr } 50 \text{ min} + 2 \text{ hr } 10 \text{ min} = 4 \text{ hr}$$

$$16 \div 4 = 4 \text{ miles per hour.}$$

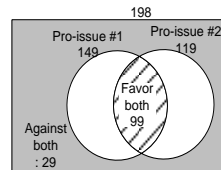
33. $2-0-1-5-2-0-1+5-2-0-1+5 = 0$

Ans = 2 asterisks enough

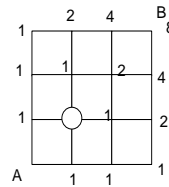
34. $60 \div 2 \div 2 = 15$

35. $198 - 29 = 169$

$$149 + 119 - 169 = 99$$



36. 8



37. $3 \times 2 \times 2 = 12$

$$3 \times 12 = \$36$$

38. $500 \times 5 = 125 \times \square$

$$\square = 4 \times 5 = 20$$

39. $100 + 60 + 80 = 240$

$$240 \times \pi = 240\pi = 240 \text{ pi}$$

40. $10 \times 70\% = 7$

$$30 \times 40\% = 12$$

$$35 \times 60\% = 21$$

$$7 + 12 + 21 = 40$$

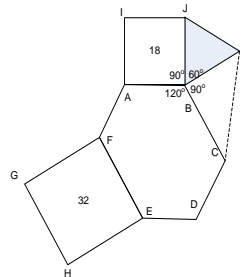
$$75 \times 60\% = 45$$

$$45 - 40 = 5$$

41. $BK = BJ = \sqrt{18}$

$$BC = EF = \sqrt{32}$$

$$\text{area}(\triangle KBC) = \frac{1}{2} \times BK \times BC = 12$$



42. D

$$A: 0.9 \times 0.8 \times 0.7 = 0.504$$

$$B: 0.8 \times 0.8 \times 0.8 = 0.512$$

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C: $0.7 \times 0.9 \times 0.8 = 0.504$

A-cell and C-cell

43. $13 \times 8 = 104$
 $13 \times 80 = 1040$
 $13 \times 77 = 1001$ ($13 \times 3 = 39$)
 $13 \times 76 = 998$
 From 8 to 76, there are
 $76 - 8 + 1 = 69$ numbers

44. $3 \times 3 \times 3 = 27$
 $27 - 7 = 20$

45. 22

2	3	2
3	2	3
2	3	2

46. C

X: π

Y: 4

Z: 3

Z, X, Y

47. 2:3:3 (#single women to married women to married men)

$$\frac{3}{2+3+3} = \frac{3}{8} = 3/8$$

48. Alex's result: {17, 18, 19}

Ben's result: {15, 18, 30}

Comparisons of random selections are listed below. Shaded boxes are the desired outcomes. So, the probability is $\frac{4}{9} = 4/9$

	17	18	19
15	✓	✓	✓
18	x	x	✓
30	x	x	x

49. $7^2 - 6^2 = 13$

50. $4 \times 4 \times 6 = 96$ (total surface)

The inner most core has $2 \times 2 \times 2 = 8$ cubes (white)

$32 - 8 = 24$ (white)

$$\frac{24}{96} = \frac{1}{4} = 1/4$$

51. $5 \times 2 + 1 = 11$

(R) (B) (W) (G) (P)

(R) (B) (W) (G) (P)

(R) (B) (W) (G) (P)

(R) (B) (W) (G) (P)

52. AB = 8

AC = 17

BC = 15

$15 \div 2 = 7.5$

53. B

$55 = 5 \times 11$

$57 = 3 \times 19$

$51 = 3 \times 17$

$49 = 7 \times 7$

$91 = 7 \times 13$

54. The minute hand moves 4 ticks, so the hourly hand slip by an angle measured

$$\frac{4}{12} \times 30 = 10^\circ$$

55. vertical direction:

$32 \times 61 = 32 \times 60 + 32$

horizontal direction:

$33 \times 60 = 32 \times 60 + 60$

Total: $32 \times 60 \times 2 + 92$

$= 3840 + 92$

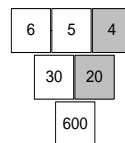
$= 3932$

56. $\frac{26}{104} = \frac{1}{4} = 25\%$ (Not listen)

$1 - 25\% = 75\%$ (Listen)

	Listen	Don't Listen	Total
Male	?	26	104
Female	58	?	96
Total	136	64	200

57. 4



58. $4\alpha = 90 + \alpha$ (exterior angle theorem)

$3\alpha = 90$

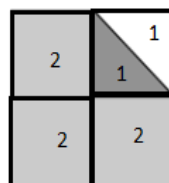
$2\alpha = 60^\circ$

59. 88

60. 38 is the smallest number.

$3 + 8 = 11$

61. 8



62. M:O = 4:1

L:O = 3:1

N:O = 2:1

$$\frac{3}{5+4+3} = \frac{1}{4} = 1/4$$

63. The radius is 2, so AC = 4.

area = $\frac{1}{2} \times 4 \times 4 = 8$

64. $2 \times 23 = 46$

65. $7 + 12 = 19$

66. The sum of the 11 numbers:

$11 \times 6 = 66$

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The sum of the 9 remaining numbers:

$$9 \times 6 = 54$$

The sum of the two removed:

$$66 - 54 = 12$$

Ans = 5 pairs of them

(1, 11), (2, 10), (3, 9), (4, 8), (5, 7)

67. 2 hr

68. $25 \div 10 = 2.5$

$$24 \div 12 = 2$$

$$2.5 - 2 = 0.5 \text{ min}$$

69. walk: 0.4 hr = 24 min

run: 14 min

$$24 - 14 = 10 \text{ min longer}$$

70. B

71. 4

1 st	2 nd	3 rd	4 th	5 th
10				
40	10			
	40	10		
		40	10	
50			40	10
	60			40
		70		
			80	
				90

72. 2 is the digit

2, 3,

6, 8, 8, 4, 2, 8,

6, 8, 8, 4, 2, 8

$$2017 - 2 = 2015$$

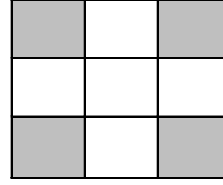
$$2015 \div 6 = _ R 5$$

The 5th digit of (, 8, 8, 4, 2, 8) is 2.

So, the 2017th digit is 2.

73. 8 cubes are on the corner.

On each face, it will look like below:



So, the answer is $\frac{5}{9} = 5/9$

74. $4 \times 3 + 1 = 13$

75. $4 \times 3 + 1 \times 3 = 15$

76. D

Any odd number can be expressed as $2n - 1$.

Let the 4 consecutive odd numbers be:

$$2n - 3, 2n - 1, 2n + 1, 2n + 3$$

The sum = $8n$, must be an 8-multiple.

77. $13^4 - 11^4$

$$= (13 - 11)(13 + 11)(13^2 + 11^2)$$

$$= 2 \times 24 \times 290$$

$$= 2 \times 8 \times 2 \times 3 \times 145$$

$$= 32 \times 3 \times 145$$

$$\text{Ans} = 5$$

78. D

$$2x + 3(x + 3)$$

$$= 5x + 9$$

79. $2 + 83 = 85$

$$2 \times 83 = 166$$

80. 17 of them

11, 12, 15,

21, 22, 24, 25,

31, 32, 33, 35, 36,

41, 42, 44, 45, 48