Set 1

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1. A grocer has 400 pounds of coffee in stock, 20 percent of which is decaffeinated. If the grocer buys another 100 pounds of coffee of which 60 percent is decaffeinated, what percent, by weight, of the grocer's stock of coffee is decaffeinated?

A. 28%
B. 30%
C. 32%
D. 34%
E. 40%

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2. If 2 different representatives are to be selected at random from a group of 10 employees and if p is the probability that both representatives selected will be women, is $p > \frac{1}{2}$?

(1) More than $\frac{1}{2}$ of the 10 employees are women.

(2) The probability that both representatives selected will be men is less than $\frac{1}{10}$.

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3. If the population of a certain country is 120,256,000 and its land area is 2,998,000 square kilometers, then the population per square kilometer is closest to which of the following?

A. 4
B. 6
C. 20
D. 40
E. 60

4. $\frac{4.8(10^9)}{1.6(10^3)} =$

A. $30(10^5)$
B. $[3(10)]^6$
C. 30^5
D. $30(10^6)$
E. $3(10^{12})$

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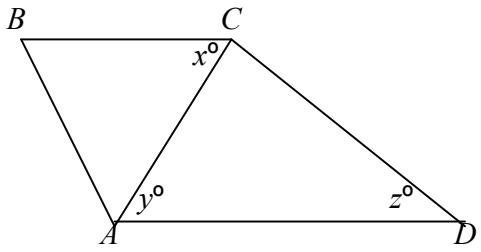
5. If $vmt \neq 0$, is $v^2m^3t^{-4} > 0$?

(1) $m > v^2$

(2) $m > t^{-4}$

6.



In the figure shown, line segment AD is parallel to line segment BC. What is the value of x?

(1) $y = 50$

(2) $z = 40$

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7. A certain university will select 1 out of 7 eligible candidates to fill a position in the mathematics department and 2 out of 10 eligible candidates to fill 2 identical positions in the computer science department. If none of the candidates is eligible for a position in both departments, how many different sets of 3 candidates are there to fill the 3 positions?

A. 42 B. 70 C. 140 D. 165 E. 315

8. The points *R*, *T,* and *U* lie on a circle that has radius 4. If the length of arc *RTU* is $\frac{4\pi}{3}$, what is the length of line segment *RU*?

A. $\frac{4}{3}$

B. $\frac{8}{3}$

C. 3

D. 4

E. 6

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9. For all integers *n*, the function *f* is defined by $f(n) = a^n$, where *a* is a constant. What is the value of $f(1)$?

(1) $f(2) = 100$

(2) $f(3) = -1{,}000$

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10. What is the value of $(x - y)^4$?

(1) The product of *x* and *y* is 7.

(2) *x* and *y* are integers.

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11. Mary persuaded *n* friends to donate $500 each to her election campaign, and then each of these *n* friends persuaded *n* more people to donate $500 each to Mary's campaign. If no one donated more than once and if there were no other donations, what was the value of *n*?

(1) The first *n* people donated $\frac{1}{16}$ of the total amount donated.

(2) The total amount donated was $120,000.

12. When n liters of fuel were added to a tank that was already $\frac{1}{3}$ full, the tank was filled to $\frac{7}{9}$ of its capacity. In terms of n, what is the capacity of the tank, in liters?

A. $\frac{10}{9}\,n$
B. $\frac{4}{9}\,n$
C. $\frac{3}{2}\,n$
D. $\frac{9}{4}\,n$
E. $\frac{7}{3}\,n$

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13. If n is a positive integer, what is the remainder when $3^{8n+3} + 2$ is divided by 5?

A. 0
B. 1
C. 2
D. 3
E. 4

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14. Of all the students in a certain dormitory, $\frac{1}{2}$ are first-year students and the rest are second-year students. If $\frac{4}{5}$ of the first-year students have not declared a major and if the fraction of second-year students who have declared a major is 3 times the fraction of first-year students who have declared a major, what fraction of all the students in the dormitory are second-year students who have <u>not</u> declared a major?

A. $\frac{1}{15}$ B. $\frac{1}{5}$ C. $\frac{4}{15}$ D. $\frac{1}{3}$ E. $\frac{2}{5}$

15. If p is the product of the integers from 1 to 30, inclusive, what is the greatest integer k for which 3^k is a factor of p?

A. 10
B. 12
C. 14
D. 16
E. 18

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16. If x and y are positive, is $x^3 > y$?

(1) $\sqrt{x} > y$

(2) $x > y$

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17. If x, y, and k are positive numbers such that $(\frac{x}{x+y})(10) + (\frac{y}{x+y})(20) = k$ and if $x<y$, which of the following could be the value of k?

A. 10
B. 12
C. 15
D. 18
E. 30

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18. What is the value of the integer k?

(1) $k + 3 > 0$

(2) $k^4 \leq 0$

19.Each of the 30 boxes in a certain shipment weighs either 10 pounds or 20 pounds, and the average (arithmetic mean) weight of the boxes in the shipment is 18 pounds. If the average weight of the boxes in the shipment is to be reduced to 14 pounds by removing some of the 20-pound boxes, how many 20-pound boxes must be removed?

A. 4 B. 6 C. 10 D. 20 E. 24

20. Tom, Jane, and Sue each purchased a new house. The average (arithmetic mean) price of the three houses was $120,000. What was the median price of the three houses?

(1) The price of Tom's house was $110,000.

(2) The price of Jane's house was $120,000.

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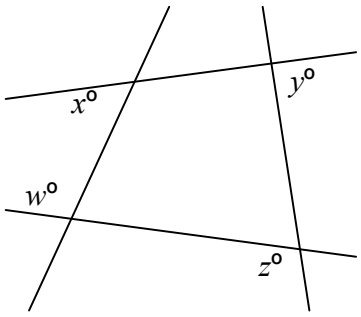
21. The results of a certain experiment included 6 data values that were all multiples of the same number c, namely, c, $8c$, $2c$, $5c$, $4c$, and $4c$. Was the average (arithmetic mean) of the 6 data values greater than 8?

(1) $c < 4$

(2) $c > 2$

22.



What is the value of $x + y$ in the figure above?

(1) $w = 95$

(2) $z = 125$

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23. The age of the Earth is approximately 1.3×10^{17} seconds, and one year is approximately 3.2×10^{7} seconds. Which of the following is closest to the age of the Earth in years?

A. 2.5×10^{9} B. 4.1×10^{9} C. 1.9×10^{10} D. 2.5×10^{11} E. 4.1×10^{11}

24. Four staff members at a certain company worked on a project. The amounts of time that the four staff members worked on the project were in the ratio 2:3:5:6. If one of the four staff members worked on the project for 30 hours, which of the following CANNOT be the total number of hours that the four staff members worked on the project?

A. 80
B. 96
C. 160
D. 192
E. 240

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25. If the sequence $x_1, x_2, x_3 \ldots, x_n$, is such that $x_1 = 3$ and $x_{n+1} = 2x_n - 1$ for $n \geq 1$, then what is the value of $(x_{20} - x_{19})$?

A. 2^{19}
B. 2^{20}
C. 2^{21}
D. $2^{20} - 1$
E. $2^{21} - 1$

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26. If the units digit of the three-digit positive integer k is nonzero, what is the tens digit of k?

(1) The tens digit of $k + 9$ is 3.

(2) The tens digit of $k + 4$ is 2.

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27. $2 + 2 \times 3 + 3 \times 4 =$

A. 20
B. 24
C. 40
D. 60
E. 96

28. Three printing presses, R, S, and T, working together at their respective constant rates, can do a certain printing job in 4 hours. S and T, working together at their respective constant rates, can do the same job in 5 hours. How many hours would it take R, working alone at its constant rate, to do the same job?

A. 8
B. 10
C. 12
D. 15
E. 20

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29. If y is the smallest positive integer such that 3,150 multiplied by y is the square of an integer, then y must be

A. 2
B. 5
C. 6
D. 7
E. 14

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30. The total cost of an office dinner was shared equally by k of the n employees who attended the dinner. What was the total cost of the dinner?

(1) Each of the k employees who shared the cost of the dinner paid \$19.
(2) If the total cost of the dinner had been shared equally by $k + 1$ of the n employees who attended the dinner, each of the $k + 1$ employees would have paid \$18.

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31. Three of the four vertices of a rectangle in the xy-coordinate plane are (-3, 10), (2, 10) and (2, 1). What is the fourth vertex?

A. (-3, 1)
B. (-3, 2)
C. (-2, 10)
D. (2, -3)
E. (3, 10)

32.

r	s	t
u	v	w
x	y	z

Each of the letters in the table above represents one of the numbers 1, 2, or 3, and each of these numbers occurs exactly once in each row and exactly once in each column. What is the value of r?

(1) $v + z = 6$

(2) $s + t + u + x = 6$

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33. At a certain school, the ratio of the number of second graders to the number of fourth graders is 8 to 5, and the ratio of the number of first graders to the number of second graders is 3 to 4. If the ratio of the number of third graders to the number of fourth graders is 3 to 2, what is the ratio of the number of first graders to the number of third graders?

A. 16 to 15
B. 9 to 5
C. 5 to 16
D. 5 to 4
E. 4 to 5

---

34. In the xy-coordinate plane, what is the slope of line L?

(1) Line L does not intersect the line with equation $y = 1 - x$.

(2) Line L intersects the line with equation $y = x - 1$.

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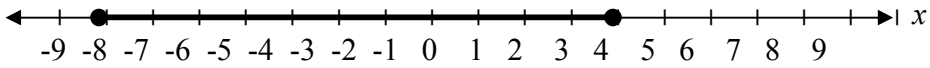
35. Guy's net income equals his gross income minus his deductions. By what percent did Guy's net income change on January 1, 1989, when both his gross income and his deductions increased?

(1) Guy's gross income increased by 4 percent on January 1, 1989.

(2) Guy's deductions increased by 15 percent on January 1, 1989.

36.



On the number line, the shaded interval is the graph of which of the following inequalities?

A. $|x| \leq 4$
B. $|x| \leq 8$
C. $|x-2| \leq 4$
D. $|x-2| \leq 6$
E. $|x+2| \leq 6$

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37. Of the 500 business people surveyed, 78 percent said that they use their laptop computers at home, 65 percent said that they use them in hotels, and 52 percent said that they use them both at home and in hotels. How many of the business people surveyed said that they do <u>not</u> use their laptop computers either at home or in hotels?

A. 45
B. 55
C. 65
D. 95
E. 130

Answers for Set 1

1. The best answer is A.

   The total amount of coffee is 400+100=500. The amount of coffee which is decaffeinated is: $\frac{20}{100}*400+\frac{60}{100}*100=140$ ➔ The percent of the decaffeinated coffee is: $\frac{140}{500}*100=28$

2. The best answer is E.

   (1) Insufficient. If there are 6 women and 4 men, the probability to choose 2 women is $\frac{6}{10}*\frac{5}{9}=\frac{1}{3}<\frac{1}{2}$. On the other hand, if all the representatives are women (there are 10 women) then the probability to choose 2 women is $1>\frac{1}{2}$

   (2) Insufficient. If there are 3 men and 7 women, the probability to choose 2 men is $\frac{3}{10}*\frac{2}{9}=\frac{6}{90}<\frac{1}{10}$ And the probability to choose 2 women is $\frac{7}{10}*\frac{6}{9}=\frac{42}{90}<\frac{1}{2}$. On the other hand, if there are 10 women, the probability to choose 2 men is $0<\frac{1}{10}$ but the probability to choose 2 women is $1>\frac{1}{2}$.

   (1+2) Insufficient. The reason is the same as in (2).

3. The best answer is D.

   The population per square kilometer is $\frac{120{,}256{,}000}{2{,}998{,}000}\approx\frac{120{,}000{,}000}{3{,}000{,}000}=40$

4. The best answer is A.

   $\frac{4.8(10^9)}{1.6(10^3)}=\frac{48(10^9)}{16(10^3)}=3(10^6)$

   Since $3(10^6)$ isn't a possibility, we will notice that $3(10^6)=30(10^5)$

5. The best answer is D.

(1) Sufficient. $m>v^2$ ➔ $m>0$ ➔ $m^3>0$. v^2 and $t^{-4} > 0$ since their powers (2 and -4) are even numbers ➔ $v^2, m^3, t^{-4} >0$ ➔ $v^2m^3t^{-4} > 0$

(2) Sufficient. $m>t^{-4}$ ➔ $m>0$ ➔ $m^3>0$. v^2 and $t^{-4} > 0$ since their powers (2 and -4) are even numbers ➔ $v^2, m^3, t^{-4} >0$ ➔ $v^2m^3t^{-4} > 0$

6. The best answer is A.

(1) Sufficient. Since AD is parallel to BC ➔ x=y (x and y are alternate angles) ➔ x=y=50.

(2) Insufficient. z=40 ➔ y+40+ACD=180 (The sum of angles in a triangle is 180). One equation with two variables.

7. The best answer is E.

The number of possibilities to choose 1 out of 7 candidates is $7\left(\frac{7!}{1!6!}\right)$. The number of possibilities to choose 2 out of 10 candidates is $\frac{10!}{2!8!} = 45$ (when the order is not important) ➔ the number of different sets of 3 candidates is 7*45=315.

8. The best answer is D.

The circumference of the circle is $2\pi R = 8\pi$. The length of arc RTU is $\frac{4\pi}{3}$ ➔ the ratio between the length of RTU to the circumference of the circle is $\frac{\frac{4\pi}{3}}{8\pi} = \frac{1}{6}$ ➔ The central angle inscribed by arc RTU is $\frac{1}{6} * 360 = 60$. Since RO=OU (let O be the center of the circle), and angle ROU is 60, triangle ROU is equilateral ➔ RU=OR=radius=4

9. The best answer is B.

(1) Insufficient. $f(2) = a^2$, $f(2) =100$ ➔ $a^2=100$ ➔ a=10 or a= -10, so $f(1)$ can be either 10 or -10.

(2) Sufficient. $f(3) = a^3$, $f(3) = -1000$ ➔ $a^3= -1{,}000$ ➔ $a= -10$ ➔ $f(1)= -10$

10. The best answer is C.

(1) Insufficient. The product of x and y is 7, not enough as x and y can have many values in decimals (e.g. 8 and 1 OR $\sqrt{7}$ and $\sqrt{7}$).

(2) Insufficient. x and y are integers, not enough as x and y can have many values.

(1+2) We know x and y are integers and that their product is 7 ➔ The only possibilities are 1 ,7 and -1, -7. The two possibilities give us x-y=6 or x-y=-6. Since $6^4 = (-6)^4$, in both cases $(x-y)^4 = 6^4$

11. The best answer is D.

Each of the n friends brought additional n friends, so the n friends brought together n^2 friends➔ The total number of friends who donated is: $n+n^2$. Since each friend donated \$500, the total donation is $500(n+n^2)$

(1) Sufficient. The donation of the first n people is: 500n. The total donation is: $500(n+n^2)$ ➔ $\frac{500n}{500(n+n^2)} = \frac{1}{16} \Rightarrow \frac{1}{1+n} = \frac{1}{16} \Rightarrow n = 15$

(2) Sufficient. $500(n+n^2)=120{,}000$ ➔ n=15.

12. The best answer is D.

Let C be the capacity of the tank. The equation is: $\frac{1}{3}C + n = \frac{7}{9}C \Rightarrow C = \frac{9}{4}n$

13. The best answer is E.

Since the pattern of the remainders repeats itself every four powers, and since 8n is a multiple of 4, the remainder of 3^{8n+3} is the same as the remainder of 3^3 which is 7 ➔the remainder of $3^{8n+3}+2$ when divided by 5 is the remainder of $\frac{2+2}{5}$, which is 4

14. The best answer is B.

Let F and S be the number of first-year students and second-year students, respectively. Let T be the total number of students. It is given that S=F=$\frac{1}{2}$ T. ➔ T=2F. $\frac{4}{5}F$ have <u>not</u> declared a major ➔ The number of first-year students

declaring a major is $\frac{1}{5}$. It is given that the fraction of second-year students who have declared a major is 3 times the fraction of first-year students who have declared a major ➔ The number of second-year students who have declared a major is $3*\frac{1}{5}=\frac{3}{5}$ ➔ The number of second-year students who have not declared a major is $\frac{2}{5}F$. The fraction of the second-year students who have not declared a major out of the total number of students is $\frac{\frac{2}{5}F}{T}=\frac{\frac{2}{5}F}{2F}=\frac{1}{5}F$

15. The best answer is C.

P=1*2*3*4* ……*30. The numbers 3, 6, 9, 12…, 30, have 3 as a factor at least once (there are 10 such numbers). The numbers 9 and 18 have 3 twice as a factor. The number 27 has the factor 3 three times ➔ k = 7+4+3=14.

16. The best answer is E.

(1) Insufficient. Consider 0<x<1 and 0<y<1. For example: x=$\frac{1}{4}$ and y=$\frac{1}{8}$. So $\sqrt{x}$>y but $x^3=\frac{1}{64}<\frac{1}{8}$. On the other hand, if x=4, y=1, then $\sqrt{x}>y$ and $x^3>y$.

(2) Insufficient. Similar to the explanation of statement 1. If we take x that is a fraction, then x^3<y even if x>y. However, if we take x>1, then x^3>y.

(1+2) Insufficient. The same explanation as the explanation of statement 1.

17. The best answer is D.

After multiplying by the common denominator (x+y), we receive: 10X+20Y=k(X+Y)➔ $k=\frac{10X+20Y}{X+Y}$. Now we can consider k as the average of two groups: X people have \$10 each and Y people have \$20 each. The expression above is the average money held by a person in the combined group ➔ The average is a number between 10 and 20, but since it is given that X<Y, the average should be closer to 20 than it is to 10. The only possibility is 18.

18. The best answer is B.

(1) Insufficient. k+3>0➔ k>-3.

(2) Sufficient. Since 4 is even, $k^4 \geq 0$, and since it is given that $k^4 \leq 0$, the only possibility is that $k^4=0$ ➔ k=0.

19. The best answer is D.

The distance of the box which weight 10 pounds from the average is 18-10= 8 (let it be D_1), and the number of such boxes will be Q_1. The distance of boxes which weight 20 pounds from the average is 20-18=2 (let it be D_2), and the number of such boxes is $Q_2=30-Q_1$. $Q_1D_1=Q_2D_2$ ➔ $-8Q_1=2(30-Q_1)$ ➔ $Q_1=6$ and $Q_2=24$. Let X be the number of 20-pound boxes which have to be removed. After the change, the average will be 14, so $D_1=4$, Q_1 is still 6, $D_2=6$ and $Q_2=24-X$ ➔ $4*6=6(24-X)$ ➔ X=20

20. The best answer is B.

(1) Insufficient. Tom's house=110,000. There are two possibilities: The first is that the two other houses cost more than 110,000 and then the median is bigger than 110,000. The second is that one of the houses costs less than 110,000 and the second costs more than 110,000, and then the median = 110,000.

(2) Sufficient. Jane's house=120,000, so if the average is 120,000, one of the houses costs above 120,000 and the other house costs below 120,000 or all three houses cost exactly 120,000 ➔ The median must be 120,000.

21. The best answer is B.

$$\text{The average} = \frac{c + 8c + 2c + 5c + 4c + 4c}{6} = 4c$$

(1) Insufficient. c<4, then 4c<16, so 4c can be either greater or smaller than 8.

(2) Sufficient. c>2 ➔ 4c>8.

22. The best answer is C.

(1) Insufficient. w=95, x and y cannot be determined.

(2) Insufficient. z=125, x and y cannot be determined.

(1+2) Sufficient. w=95, so the adjacent angle to w is180-95=85. z=125, so the adjacent angle to z equals 180-125=55. Now we have a quadrilateral that two of its angles are known. The sum of these two angles is: 85+55=140. The sum of the other two angles is 360-140=220. x and y complement these two angles to 360 ➔ x+y=360-220=140.

23. The best answer is B.

In order to move from seconds to years, we have to divide the number of seconds by the number of seconds per year: $\frac{1.3*10^{17}}{3.2*10^{7}}=\frac{13*10^{16}}{3.2*10^{7}}\approx 4.1*10^{9}$.

24. The best answer is D.

Let their hours be: 2k, 3k, 5k and 6k ➔ the total time= 2k+3k+5k+6k=16k. Now we will examine each of the four cases: If 2k=30 then k=15, and the total time=16x15=240. If 3k=30, then k=10, so the total=16x10=160. If 5k=30, k=6 and total=96. If 6k=30, k=5 and total=16x5=80. So 192 cannot be the total number of hours.

25. The best answer is A.

Let's find the first four members of the sequence in order to find its regularity. $X_1=3$, $X_2=5$, $X_3=9$, $X_4=17$, $X_5=33$. The differences between the terms has a certain regularity: $X_2-X_1=2$, $X_3-X_2=4$, $X_4-X_3=8$, $X_5-X_4=16$...➔$X_n-X_{n-1}=2^{n-1}$➔ $X_{20}-X_{19}=2^{19}$

26. The best answer is A.

Let x be the units digit of k. ($x\neq 0$).

(1) Sufficient. Since x is not zero, then x+9 is at least 10➔when adding 9 the tens digit of k will increase by 1➔if the tens digit of k+9 is 3, then the tens digit of k is 2.

(2) Insufficient. x+4 might be smaller than ten. We can not determine whether the tens digit of k+4 will increase by 1 or not. For example, k=684 ➔ k+4=688, and the tens digit stays the same, and on the other hand, if k=689, then k+4=693, and the tens digit has increased by 1.

27. The best answer is A.

The multiplication is always prior to the addition: $2+2\times3+3\times4= 2+(2\times3)+(3\times4)=20$

28. The best answer is E.

The combined work rate of the three printing presses equals $\frac{1}{R}+\frac{1}{S}+\frac{1}{T}=\frac{1}{4}$. The combined work rate of S and T equals $\frac{1}{S}+\frac{1}{T}=\frac{1}{5}$ ➔ $\frac{1}{R}=\frac{1}{4}-\frac{1}{5}$ ➔ $\frac{1}{R}=\frac{1}{20}$ ➔ $R=20$

29. The best answer is E.

3,150y is a perfect square. 3,150 = 2*3*3*5*5*7 (the prime factors of 3,150). In order to receive a perfect square, all factors should be in groups of two or any other multiple of two. The factors 3 and 5 already appear twice, but 2 and 7 should also appear at least twice ➔ the minimum value of y is 2 x 7 =14

30. The best answer is C.

(1) Insufficient. Total cost =19k, k is unknown.

(2) Insufficient. Total cost = 18(k+1), k is unknown.

(1+2) Sufficient. We receive the equation: 19k = 18(k+1) ➔ k=18 ➔ the total cost equals 18* 19=342.

31. The best answer is A.

A=(-3,10), B=(2,10), C=(2,1), D=(X_D, Y_D). If we draw these points on the xy-coordinate plane, we will notice that since it's a rectangle, DC has to be parallel to AB, and that will happen only if $Y_D=Y_C=1$. Similarly, we see that AD has to be parallel to BC. That will happen only if $X_D=X_A=-3$ ➔ D=(-3,1)

32. The best answer is D.

(1) Sufficient. If v + z = 6, then v and z has to be each 3 (because if one of them is smaller than 3, the other one must be greater than 3, which is impossible) ➔ no other letter in the rows or columns of v and z can equal 3 ➔ r, which is the only letter that is not in the same column nor row as v and z, must equal 3.

(2) Sufficient. If s + t + u + x = 6, the only possibility is: 1 + 2 + 1 + 2 = 6 (not necessarily in this order) ➔ s equals 1 or 2, and t also equals 1 or 2. Since the number 3 has to exist once in each row r has to be 3.

33. The best answer is E.

$\frac{first}{second}=\frac{3}{4}=\frac{6}{8}$, $\frac{second}{fourth}=\frac{8}{5}$ ➔ because the value representing the second graders is equal in both fractions we are allowed to conclude that $\frac{first}{fourth}=\frac{6}{5}$.

$\frac{first}{fourth}=\frac{6}{5}=\frac{12}{10}$, And we also know that $\frac{third}{fourth}=\frac{3}{2}=\frac{15}{10}$ ➔ because the value representing the forth graders is equal in both fractions we are allowed to conclude that $\frac{first}{third}=\frac{12}{15}=\frac{4}{5}$

34. The best answer is A.

(1) Sufficient. Line L doesn't intersect y= 1–x ➔ line L is parallel to y= 1–x ➔the slope of L equals the slope of y= 1–x, which is -1.

(2) Insufficient. Line L intersects y= x-1. We can determine the slope of a certain line only with reference to other lines if they are either parallel or perpendicular ➔ we can not know the slope of line L.

35. The best answer is E.

The easiest way is to plug in two different sets of numbers, and see that there is no consistency (e.g. Income=100, Deductions 100 OR Income=100, Deductions 1).

36. The best answer is E.

The shaded interval is: $-8 \le x \le 4$. Let's see what is the interval which is created by each of the inequalities: **(A)** the interval is $-4 \le x \le 4$ ➔ unsuitable **(B)** the interval is $-8 \le x \le 8$ ➔ unsuitable **(C)** the interval is $-4 \le x-2 \le 4$ ➔ $-2 \le x \le 6$ ➔ unsuitable **(D)** the interval is $-6 \le x-2 \le 6$ ➔ $-4 \le x \le 8$ ➔ unsuitable **(E)** the interval is $-6 \le x+2 \le 6$ ➔ $-8 \le x \le 4$ ➔ this inequality is suitable.

37. The best answer is A.

All- None = Use at Home + Use at Hotels – Use in both ➔

$$500 - None = \frac{78}{100} * 500 + \frac{65}{100} * 500 - \frac{52}{100} * 500 \rightarrow$$

$500 - None = 390 + 325 - 260 = 455$ ➔ None=45