

Set 4

1. If k is negative, which of the following must also be negative?

- A. $(-k)^2$
- B. $(-1)k$
- C. $1 - k$
- D. $k + 1$
- E. $k - 1$

2. On Saturday morning, Malachi will begin a camping vacation and he will return home at the end of the first day on which it rains. If on the first three days of the vacation the probability of rain on each day is 0.2, what is the probability that Malachi will return home at the end of the day on the following Monday?

- A. 0.008
- B. 0.128
- C. 0.488
- D. 0.512
- E. 0.640

3. Each of the 45 boxes on shelf J weighs less than each of the 44 boxes on shelf K. What is the median weight of the 89 boxes on these shelves?

- (1) The heaviest box on shelf J weighs 15 pounds.
- (2) The lightest box on shelf K weighs 20 pounds.

4. What is the total value of Company H's stock?

- (1) Investor P owns $\frac{1}{4}$ of the shares of Company H's total stock.
- (2) The total value of Investor Q's shares of Company H's stock is \$16,000.

5. If $(y+3)(y-1) - (y-2)(y-1) = r(y-1)$, what is the value of y ?

(1) $r^2 = 25$

(2) $r = -5$

6. If x and k are integers and $(12^x)(4^{2x+1}) = (2^k)(3^2)$, what is the value of k ?

A. 5

B. 7

C. 10

D. 12

E. 14

7. If $x < 0$, then $\sqrt{(-x) \cdot |x|} =$

A. $-x$

B. -1

C. 1

D. x

E. $0.x$

8. A thin piece of wire 40 meters long is cut into two pieces. One piece is used to form a circle with radius r , and the other is used to form a square. No wire is left over. Which of the following represents the total area, in square meters, of the circular and the square regions in terms of r ?

A. πr^2

B. $\pi r^2 + 10$

C. $\pi r^2 + \frac{1}{4} \pi 2r^2$

D. $\pi r^2 + (40 - 2\pi r)^2$

E. $\pi r^2 + \left(10 - \frac{1}{2} \pi r\right)^2$

9. If r is a constant and $a_n = r \cdot n$ for all positive integers n , for how many values of n is $a_n < 100$?

(1) $a_{50} = 500$

(2) $a_{100} + a_{105} = 2,050$

10. If the length of a certain rectangle is 2 greater than its width, what is the perimeter of the rectangle?

(1) The length of each diagonal of the rectangle is 10.

(2) The area of the rectangular region is 48.

11. If s is the product of the integers from 100 to 200, inclusive, and t is the product of the integers from 100 to 201, inclusive, what is $1/s + 1/t$ in terms of t ?

A. $(201)\frac{2}{t}$

B. $\frac{202 * 201}{t}$

C. $\frac{201}{t}$

D. $\frac{202}{t}$

E. $\frac{202 * 201}{t^2}$

12. A certain dealership has a number of cars to be sold by its salespeople. How many cars are to be sold?

(1) If each of the salespeople sales 4 of the cars, 23 cars will remain unsold.

(2) If each of the salespeople sales 6 of the cars, 5 cars will remain unsold.

13. A certain farmer pays \$30 per acre per month to rent farmland. How much does the farmer pay per month to rent a rectangular plot of farmland that is 360 feet by 605 feet? (43,560 square feet = 1 acre)

- A. \$5,330
- B. \$3,360
- C. \$1,350
- D. \$360
- E. \$150

14. How many seconds will it take for a car that is traveling at a constant rate of 45 miles per hour to travel a distance of 22 yards? (1 mile = 1,760 yards)

- A. 8
- B. 9
- C. 10
- D. 11
- E. 12

15. If n and k are positive integers, is $\frac{n}{k}$ an even integer?

- (1) n is divisible by 8.
- (2) k is divisible by 4.

16. If n is a positive integer and r is the remainder when $(n-1)(n+1)$ is divided by 24, what is the value of r ?

- (1) 2 is not a factor of n .
- (2) 3 is not a factor of n .

17. Which of the following is equal to $\frac{1}{(\sqrt{3} - \sqrt{2})^2}$?

- A. 1
- B. 5
- C. $\sqrt{6}$
- D. $5 - \sqrt{6}$
- E. $5 + 2\sqrt{6}$

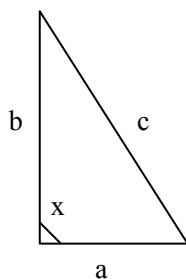
18. Last year the price per share of Stock X increased by k percent and the earnings per share of Stock X increased by m percent, where k is greater than m . By what percent did the ratio of price per share to earnings per share increase, in terms of k and m ?

- A. k/m %
- B. $(k-m)$ %
- C. $[100(k-m)]/(100+k)$ %
- D. $[100(k-m)]/(100+m)$ %
- E. $[100(k-m)]/(100+k+m)$ %

Month	Number of Days Worked
June	20
July	17
August	19

19. The table above shows the number of days worked by a certain sales representative in each of three months last year. If the number of sales calls that the representative made each month was proportional to the number of days worked in that month and if the representative made a total of 168 sales calls in the three months shown, how many sales calls did the representative make in August?

- A. 50
- B. 51
- C. 56
- D. 57
- E. 60



20. In the triangle above, is $x > 90^\circ$?

- (1) $a^2 + b^2 < 15$
- (2) $c > 4$

21. On a recent trip, Mary drove 50 miles. What was the average speed at which she drove the 50 miles?

(1) She drove 30 miles at an average speed of 60 miles per hour and then drove the remaining 20 miles at an average speed of 50 miles per hour.

(2) She drove a total of 54 minutes.

22. If a company allocates 15 percent of its budget to advertising, 10 percent to capital improvements, and 55 percent to salaries, what fraction of its budget remains for other allocations?

- A. $\frac{4}{5}$
- B. $\frac{3}{5}$
- C. $\frac{3}{10}$
- D. $\frac{1}{5}$
- E. $\frac{1}{10}$

23. If $-1 < h < 0$, which of the following has the greatest value?

- A. $1 - h$
- B. $1 + h$
- C. $1 + h^2$
- D. $1 - \frac{1}{h}$
- E. $1 - \frac{1}{h^2}$

24. A glass was filled with 10 ounces of water, and 0.01 ounce of the water evaporated each day during a twenty-day period. What percent of the original amount of water evaporated during this period?

- A. 0.002%
- B. 0.02%
- C. 0.2%
- D. 2%
- E. 20%

25. In the xy -plane, what is the slope of the line with equation $3x + 7y = 9$?

- A. $-\frac{7}{3}$
- B. $-\frac{3}{7}$
- C. $\frac{3}{7}$
- D. 3
- E. 7

26. What is the value of the expression $(n-x) + (n-y) + (n-c) + (n-k)$?

- (1) The average (arithmetic mean) of x , y , c , and k is n .
- (2) x , y , c , and k are consecutive integers.

27. If f is the function defined for all k by $f(k) = \frac{k^5}{16}$, what is $f(2k)$ in terms of $f(k)$?

- A. $\frac{1}{8} f(k)$
- B. $\frac{5}{8} f(k)$
- C. $2 f(k)$
- D. $10 f(k)$
- E. $32 f(k)$

28. If x and y are integers and $x > 0$, is $y > 0$?

- (1) $7x - 2y > 0$
- (2) $-y < x$

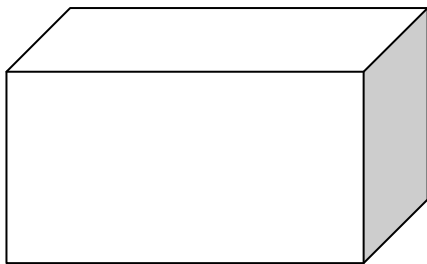
29. Each week a certain salesman is made a fixed amount equal to \$300 plus a commission equal to 5 percent of the amount of these sales that week over \$1,000.

What is the total amount the salesman was paid last week?

- (1) The total amount the salesman was paid last week is equal to 10 percent of the amount of these sales last week.
- (2) The salesman's sales last week total \$5,000.

30. The membership of a committee consists of 3 English teachers, 4 Mathematics teachers, and 2 Social Studies teachers. If 2 committee members are to be selected at random to write the committee's report, what is the probability that the two members selected will both be English teachers?

- A. $\frac{2}{3}$
- B. $\frac{1}{3}$
- C. $\frac{2}{9}$
- D. $\frac{1}{12}$
- E. $\frac{1}{24}$



31. In the rectangular solid above, the three sides shown have areas 12, 15, and 20, respectively. What is the volume of the solid?

- A. 60
- B. 120
- C. 450
- D. 1,800
- E. 3,600

32. If S is a set of ten consecutive integers, is the integer 5 in S ?

- (1) The integer -3 is in S .
- (2) The integer 4 is in S .

33. A photographer will arrange 6 people of 6 different heights for photograph by placing them in two rows of three so that each person in the first row is standing in front of someone in the second row. The heights of the people within each row must increase from left to right, and each person in the second row must be taller than the person standing in front of him or her. How many such arrangements of the 6 people are possible?

- A. 5
- B. 6
- C. 9
- D. 24
- E. 36

34. If Line k in the xy -plane has equation $y = mx + b$, where m and b are constants, what is the slope of k ?

- (1) k is parallel to the line with equation $y = (1-m)x + b + 1$.
- (2) k intersects the line with equation $y = 2x + 3$ at the point $(2, 7)$.

35. In June 1989, what was the ratio of the number of sales transactions made by Salesperson X to the number of sales transactions made by Salesperson Y?

- (1) In June 1989, Salesperson X made 50 percent more sales transactions than Salesperson Y did in May 1989.
- (2) In June 1989, Salesperson Y made 25 percent more sales transactions than in May 1989.

36. If M is the least common multiple of 90, 196, and 300, which of the following is NOT a factor of M ?

- A. 600
- B. 700
- C. 900
- D. 2,100
- E. 4,900

37. If $\frac{k}{60,125} = 0.001$, what is the units digit of k ?

- A. 0
- B. 1
- C. 2
- D. 5
- E. 6

Answers for set 4

1. The best answer is E.

- A. The square of a positive integer is positive
- B. The product of 2 negative numbers is positive.
- C. Subtracting a negative number is equivalent to adding its absolute value
- D. $k+1$ can be either positive or negative. E.g. $k = -5$ or $k = -0.5$
- E. $k-1$ must be negative since we subtract a positive number from a negative number

2. The best answer is B.

The probability that it will rain on a certain day is 0.2 → the probability that it will not rain on a certain day is $1-0.2=0.8$. $P(\text{Malachi will return home at the end of the day on the following Monday}) = P(\text{it will not rain on Saturday and on Sunday and will rain on Monday}) = P(\text{it will not rain on Saturday}) * P(\text{it will not rain on Sunday}) * (It will rain on Monday) = (0.8) * (0.8) * (0.2) = 0.128$

3. The best answer is A.

Since there are 89 boxes, the median will be the weight of the 45th box.

- (1) Sufficient. The heaviest box on shelf J is heavier than the other 44 boxes on shelf J and lighter than the 44 boxes on shelf K → The weight of this box is the median → 15 pounds is the median weight.
- (2) Insufficient.

4. The best answer is E.

- (1) Insufficient. The value of P's shares is unknown
 - (2) Insufficient. All we know is that the value of the stock is at least \$16,000.
- (1+2) Insufficient. Notice that each of the statements relates to a different investor.

5. The best answer is E.

$(y+3)(y-1) - (y-2)(y-1) = r(y-1) \rightarrow 5y-5 = ry-r \rightarrow y(5-r) = (5-r)$ we can divide the equation by $(5-r)$, and taking $(5-r)=0$ as a possible solution $\rightarrow r=5$ (and then y can get any value) or $y=1$ (and then r can get any value).

(1) Insufficient. $r^2=25 \rightarrow r=5$ or $r=-5 \rightarrow$ If $r=5$ y can get any value $\rightarrow$ not sufficient

(2) Sufficient. $r \neq 5 \rightarrow y$ must be 1

6. The best answer is E.

$(12^x)(4^{2x+1}) = (2^2 \cdot 3)^x (2^2)^{2x+1} = 2^{2x} \cdot 3^x \cdot 2^{4x+2} = (2^{6x+2})(3^x) \rightarrow (2^{6x+2})(3^x) = (2^k)(3^2)$
 $\rightarrow 6x+2=k$ and $x=2 \rightarrow k=14$

7. The best answer is A.

$x < 0 \rightarrow (-x)$ is positive and $|x|$ is positive $\rightarrow \sqrt{(-x) \cdot |x|} = \sqrt{|x||x|} = \sqrt{|x|^2} = |x| = -x$.

8. The best answer is E.

The perimeter of the circle, whose radius is r , is $2\pi r \rightarrow$ The length of the second

piece is $40 - 2\pi r \rightarrow$ Each side of the square is $\frac{40 - 2\pi r}{4} = 10 - \frac{1}{2}\pi r \rightarrow$ The area of the

square is $\left(10 - \frac{1}{2}\pi r\right)^2 \rightarrow$ the total area is: $\pi r^2 + \left(10 - \frac{1}{2}\pi r\right)^2$

9. The best answer is D.

$a_n < 100$ means $r^n < 100$, so we have to solve this inequality. In order to solve it, we need to know r .

(1) Sufficient. $a_{50} = 500 \rightarrow 50r = 500 \rightarrow r = 10$. So we have to solve $10n < 100 \rightarrow n < 10$.

(2) Sufficient. $a_{100} + a_{105} = 2,050 \rightarrow 100r + 105r = 2050 \rightarrow r = 10 \rightarrow 10n < 100 \rightarrow n < 10$.

10. The best answer is D.

Let x be the width of the rectangle $\rightarrow$ the perimeter is $=4x+4 \rightarrow$ we need to find x .

- (1) Sufficient. The rectangle is composed of two right triangles whose hypotenuse is 10 (the diagonal) and whose perpendiculars are x and $x+2$. Using Pythagorean Theorem we will get an equation with one variable

$$(x^2 + (x + 2)^2 = 10^2).$$

- (2) Sufficient. We receive the equation: $x(x+2) = 48 \rightarrow x=6$ or $x=-8 \rightarrow x=6$

11. The best answer is D.

$$t = (100*101*102*.....*200)*201$$

$$s = (100*101*102*.....*200)$$

Since we are asked to express $\frac{1}{s} + \frac{1}{t}$ in terms of t , we will express s in terms of t .

$$\text{We see that } s = \frac{t}{201} \rightarrow \frac{1}{s} + \frac{1}{t} = \frac{201}{t} + \frac{1}{t} = \frac{201}{t}$$

12. The best answer is C.

Let n be the number of salespeople.

- (1) Insufficient. The number of cars to be sold is $4n+23$, but n is unknown, so we can't find $4n+23$.
- (2) Insufficient. The number of cars to be sold is $6n+5$, but n is unknown, so we can't find $6n+5$.

(1+2) Sufficient. We receive the equation: $4n+23=6n+5 \rightarrow n=9$ (The number of cars for sale is: $4*9+23=59$)

13. The best answer is E

The area of the plot in square feet is $360*605=217,800$. $\rightarrow$ The area in terms of acres

$$\text{is } \frac{217,800}{43,560} \rightarrow \text{the sum that the farmer pays is } \frac{217,800}{43,560} * 30 = 150$$

14. The best answer is E.

The speed of the car is $\frac{45}{1}$ miles per hour $\rightarrow \frac{45}{3600}$ miles per second $\rightarrow$

$\frac{45 \cdot 1760}{3600} = \frac{176}{8} = 22$ yards per second $\rightarrow$ to travel 22 yards will take the car exactly one second.

15. The best answer is E.

(1) Insufficient. E.g. $n=8, k=4 \rightarrow \frac{n}{k}=2$, or $n=8, k=8$ then $\frac{n}{k}=1$.

(2) Insufficient. E.g. $n=8, k=4 \rightarrow \frac{n}{k}=2$, or $n=8, k=8$ then $\frac{n}{k}=1$.

(1+2) Insufficient. E.g. $n=8, k=4 \rightarrow \frac{n}{k}=2$, or $n=8, k=8$ then $\frac{n}{k}=1$.

16. The best answer is C.

(1) Insufficient. If n is not a factor of n , then $(n-1)(n+1)$ is divisible by 8.

(2) Insufficient. If 3 is not a factor of n , then 3 is a factor of either $(n-1)$ or $(n+1)$
 $\rightarrow (n-1)(n+1)$ is divisible by 3.

(1+2) Sufficient. Using both statements $(n-1)(n+1)$ is divisible by both 8 and 3, and therefore it is also divisible by 24.

17. The best answer is E.

$$\frac{1}{(\sqrt{3}-\sqrt{2})^2} = \frac{1}{3-2\sqrt{6}+2} = \frac{1}{5-2\sqrt{6}} = \frac{(5+2\sqrt{6})}{(5-2\sqrt{6})(5+2\sqrt{6})} = \frac{5+2\sqrt{6}}{5^2-(2\sqrt{6})^2} = \frac{5+2\sqrt{6}}{25-4 \cdot 6} = 5+2\sqrt{6}$$

18. The best answer is D.

Let P be the original price per share of Stock X.

Let E be the original earnings per share of Stock X.

The original ratio of price per share to earnings per share is $\frac{P}{E}$. The new ratio of

price per share to earnings per share is $\frac{\frac{(100+k)P}{100}}{\frac{(100+m)E}{100}} = \frac{(100+k)P}{(100+m)E}$. We are looking for

$\frac{(\text{The new ratio}) - (\text{The old ratio})}{(\text{The old ratio})} \rightarrow$

$\frac{\frac{(100+k)P}{(100+m)E} - \frac{P}{E}}{\frac{P}{E}} = \frac{(100+k)}{(100+m)} - 1 = \frac{100+k-(100+m)}{100+m} = \frac{k-m}{100+m}$. Since the answer

has to be in terms of percents, we have to multiply by 100 and receive $\frac{100(k-m)}{100+m}\%$

19. The best answer is D.

Since the number of sales is proportional to the number of days worked in that month, the number of calls made in June, July and August is $20x$, $17x$ and $19x$, respectively.

The total number of sales call is 168 $\rightarrow 20x+17x+19x=168 \rightarrow x=3 \rightarrow$ The number of calls in August is $19x=19*3=57$

20. The best answer is C.

In a triangle with sides a, b and c, if $a^2+b^2=c^2$, then the angle between a and b is equal to 90° . But actually, we can know more than that: if $a^2+b^2 < c^2$, then the angle between a and b is greater than 90° . Similarly, if $a^2+b^2 > c^2$, then the angle between a and b is smaller than 90° .

(1) Insufficient.

(2) Insufficient.

(1+2) Sufficient. $a^2+b^2 < c^2 \rightarrow$ x is greater than 90° .

21. The best answer is D.

Average speed = $\frac{\text{Total distance}}{\text{Total Time}}$. The total distance is given in the question → in order

to answer the question we need the total time.

(1) Sufficient. The total time can be found.

(2) Sufficient. The total time is given

22. The best answer is D.

The number of percents remaining for other allocations is $100 - (15 + 10 + 55) = 20\%$,

which is equal to $\frac{1}{5}$

23. The best answer is D.

The easiest way to solve this question is by choosing a number between -1 and 0, and

plugging it in the answers. If $h = -\frac{1}{2}$:

- A. 1.5
- B. 0.5
- C. 1.25
- D. 3
- E. -3

24. The best answer is D.

The original amount is 10 ounces. The total amount which was lost is $20 * 0.01 = 0.2$

ounces → the percent which was lost is $\frac{0.2}{10} * 100 = 2$

25. The best answer is B.

$3x + 7y = 9 \rightarrow 7y = -3x + 9 \rightarrow y = -\frac{3}{7}x + \frac{9}{7} \rightarrow$ the slope of the line is $-\frac{3}{7}$

26. The best answer is A.

(1) Sufficient. $(n-x) + (n-y) + (n-c) + (n-k) = 4n - (x+y+c+k)$. it is given that

$$n = \frac{\text{sum}}{4} \Rightarrow x + y + c + k = 4n \rightarrow 4n - 4n = 0.$$

(2) Insufficient.

27. The best answer is E.

By definition, $f(2k) = \frac{(2k)^5}{16} = \frac{32k^5}{16} = 32 * \frac{k^5}{16} = 32f(k)$.

28. The best answer is E.

(1) Insufficient. E.g. $x=10 \rightarrow 7(10) - 2y > 0 \rightarrow y < 35$.

(2) Insufficient. E.g. $x=10 \rightarrow -y < 10 \rightarrow y > -10$.

(1+2) Insufficient. E.g. $x=10 \rightarrow -10 < y < 35$

29. The best answer is D.

Let S be the amount of the salesman's sales last week $\rightarrow$ The total amount he was paid

last week is $300 + \frac{5}{100}(S - 1,000) \rightarrow$ we need to find S.

(1) Sufficient. $300 + \frac{5}{100}(S - 1,000) = \frac{10S}{100} \rightarrow$ we can find S ($S=5,000$)

(2) Sufficient.

30. The best answer is D.

The number of members in the committee is $3+4+2=9$, and there are 3 English teachers $\rightarrow$ the probability that the first member selected will be an English teacher

is $\frac{3}{9}$. The probability that the second will also be an English teacher is $\frac{2}{8} \rightarrow$ the

probability that they will be both English teachers is $\frac{3}{9} * \frac{2}{8} = \frac{1}{12}$

31. The best answer is A.

Let x , y and z be the 3 sides of the solid rectangle $\rightarrow xy=12$, $yz=15$ and $xz=20$.

The solution of these 3 equations is : $x=4$, $y=3$, $z=5 \rightarrow$ The volume = $4*3*5=60$.

32. The best answer is E.

(1) Insufficient. If $S=\{-3,-2,-1,0,1,2,3,4,5,6\}$ then 5 is in S . But if

$S=\{-5,-4,-3,-2,-1,0,1,2,3,4\}$ then 5 is not in S .

(2) Insufficient. If $S=\{4,5,6,7,8,9,10,11,12,13\}$ then 5 is in S but if

$S=\{-5,-4,-3,-2,-1,0,1,2,3,4\}$ then 5 is not in S .

(1+2) Insufficient. If $S=\{-3,-2,-1,0,1,2,3,4,5,6\}$ then 5 is in S and if

$S=\{-5,-4,-3,-2,-1,0,1,2,3,4\}$ then 5 is not in S .

33. The best answer is A.

The smallest (let him be 1) has to be on the left of the first row, and the highest 6 (let him be 6) has to be on the right of the second row. The possibilities are:

1	2	3	-----	1	2	3	-----	1	2	4	-----	1	2	5	-----	1	3	4	-----	1	3	5	
4	5	6		4	5	6		3	5	6		3	4	6		2	5	6		2	4	6	

34. The best answer is A.

The slope of k is m .

(1) Sufficient. k is parallel to the line with equation $y = (1-m)x + b + 1 \rightarrow$ The

slope of k is equal to the slope of $y \rightarrow m=1-m \rightarrow m = \frac{1}{2}$

(2) Insufficient. The only thing we learn about the slope from this statement is that it doesn't equal 2.

35. The best answer is C.

Let X_J and X_M be the number of sales transactions made by Salesperson X in June 1989 and in May 1989, respectively. Let Y_J and Y_M be the number of sales transactions made by Salesperson X in June 1989 and in May 1989, respectively.

We are looking for $\frac{X_J}{Y_J}$

(1) Insufficient. $X_J = \frac{150}{100} Y_M$.

(2) Insufficient. $Y_J = \frac{125}{100} Y_M$.

(1+2) Sufficient. Combining 1 and 2, we receive: $\frac{X_J}{Y_J} = \frac{\frac{150Y_M}{100}}{\frac{125Y_M}{100}} = \frac{150}{125} = \frac{6}{5}$.

36. The best answer is A.

$90=2*3*3*5$, $196=2*2*7*7$ and $300=2*2*3*5*5 \rightarrow \text{LCM}(90,196,300)=2^2*3^2*5^2*7^2$.
 $600=2*300=2*2*2*3*5*5$. Since the factor 2 appears in 600 3 times whereas in M it appears only 2 times, 600 is not a factor of M.

37. The best answer is A.

$\frac{k}{60125} = 0.001 \Rightarrow k = 60125 * 0.001 = 60.125 \rightarrow$ The unit's digit of k is 0.