



KMF

1147

QUANT



Math Sprint Practice

Section 1 Medium

The positive integer x is 7 greater than a multiple of 13, and $2512 < x^2 < 3596$.

Quantity A

3

AB=12, AC=

Quantity A

The measure of angle BDC

A number is to be randomly selected from the integers from 1 through 87.

Quantity A

The probability that the number selected will have a units digit of 6

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
a multiple of 13, and $2512 < x^2$

nd $AD = 2/5(AC)$.

Quantity B

55

Quantity B

120

Quantity A

$$\frac{qs}{r}$$

number is to be randomly selected.

Quantity B

$$r = \frac{1}{r}$$

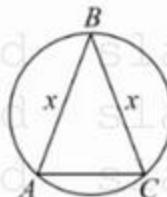
The probability that the number selected will have a tens digit of 6



5.

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
6.

slackahead slackahead slackahead slackahead
w, x, y and z are integers
slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead
w < x and y < z
Quantity A slackahead slackahead **Quantity B**
wy slackahead slackahead xz
slackahead slackahead slackahead



Triangle ABC is inscribed in the circle.

Quantity A

The radius of the circle

Quantity B

The length of AC

7.

slackahead

slackahead

slackahead

slackahead

In region A, 17 percent of the acres that are planted with corn are planted with a certain hybrid seed. In region B, which borders region A, 11 percent of the acres that are planted with corn are planted with the same hybrid seed.

Quantity A

Of all the acres planted with corn in region A and region B combined, the percent of acres that are planted with the hybrid seed

Quantity B

14%

8.

slackahead
slackahead
slackahead

slackahead
slackahead
slackahead

slackahead
slackahead
slackahead

slackahead
slackahead
slackahead

$$0 < a < b < 1$$

c and d are positive integers such that c < d

Quantity A

$$a^{c-d}$$

Quantity B

$$b^{d-c}$$



12. slackahead

slackahead slackahead slackahead

slackahead slackahead slackahead

In the xy-plane, a triangle has vertices $(0, 0)$, $(k, 0)$ and $(k, -4k)$, where $k > 0$. If the area of the region enclosed by the triangle is 32, what is the value of k ?

slackahead slackahead slackahead

slackahead slackahead slackahead

slackahead slackahead slackahead

slackahead slackahead slackahead

slackahead $\textcircled{O} 4\sqrt{2}$ slackahead slackahead

slackahead slackahead slackahead

slackahead $\textcircled{O} 2\sqrt{2}$ slackahead slackahead

slackahead slackahead slackahead

 $\textcircled{O} \sqrt{2}$

slackahead slackahead slackahead

slackahead slackahead slackahead

 $\textcircled{O} 4$

slackahead slackahead slackahead

slackahead slackahead slackahead

 $\textcircled{O} 8$

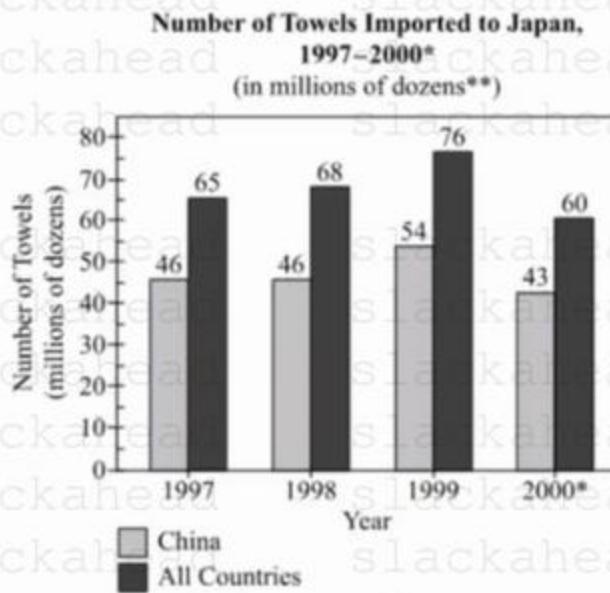
slackahead slackahead slackahead

13. Each of the 1,800 households that participated in a survey owned either one car, two cars, or no cars. If 740 of the households owned only one car and at least $\frac{1}{3}$ of the households owned two cars, what is the greatest possible value of the ratio of the number of households that owned no cars to the number of households that owned two cars?

Give your answer as a fraction.

14.

For each of the years 1997 through 2000*, the graph shows the number of towels imported to Japan from China, and the total number of towels imported to Japan from all countries, including China.



* For the first nine months of 2000

** 1 dozen = 12

In 1998, how many of the imported towels were not imported from China?

260 million

264 million

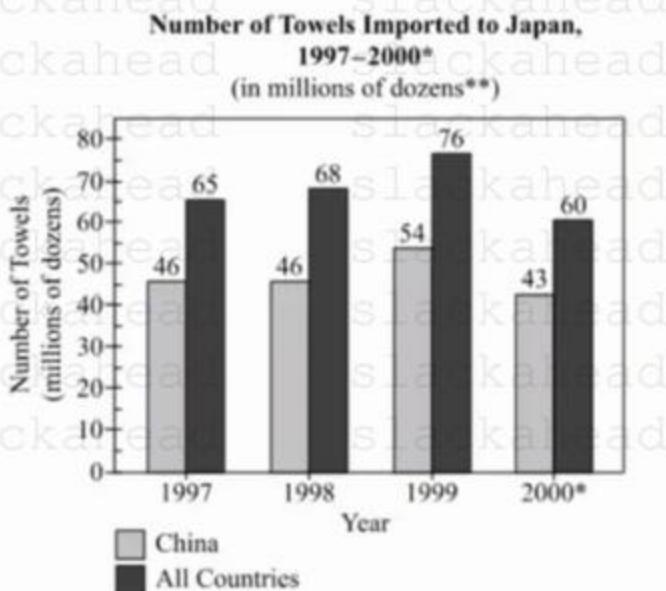
268 million

272 million

276 million

15.

For each of the years 1997 through 2000*, the graph shows the number of towels imported to Japan from China, and the total number of towels imported to Japan from all countries, including China.



* For the first nine months of 2000

** 1 dozen = 12

If the average (arithmetic mean) number of towels imported from China per month was the same for the last 3 months of 2000 as it was for the first 9 months of 2000, approximately how many million dozen towels were imported from China during the 12 months of 2000?

57

63

76

80

86



16.

For each of the years 1997 through 2000*, the graph shows the number of towels imported to Japan from China, and the total number of towels imported to Japan from all countries, including China.



In 1999, the ratio of the number of towels imported from China to the total number of towels imported from countries other than China was closest to which of the following?

- 7 to 2
- 3 to 1
- 5 to 2

- 2 to 1
- 3 to 2

17.

The sum of ten different positive integers is 101. What is the greatest possible value of the maximum among the integers?



20.

slackahead

slackahead

slackahead

slackahead

For a group of 9 steel beams stored together, the average (arithmetic mean) length of the beams is 7.2 meters and the median length is 8.4 meters. Two additional steel beams—one that is longer than all 9 beams and one that is shorter than all 9 beams—will be stored with the 9 beams. For the combined group of 11 steel beams, the average length is m meters and the median length is d meters. Which of the following statements must be true?

Indicate all such statements.

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

 $m < 7.2$ $m = 7.2$ $m > 7.2$ $d < 8.4$ $d = 8.4$ $d > 8.4$

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

Section 2 Hard

slackahead

Five different families received tax bills at the beginning of the year. Later, the four lowest tax bills were each reduced by \$200 while the highest tax bill remained the same.

Quantity A

The standard deviation of the original five tax bills

Quantity B

The standard deviation of the resulting five tax bills

after the four lowest tax bills were reduced

slackahead

The average (arithmetic mean) of m and n is 1 more than k .

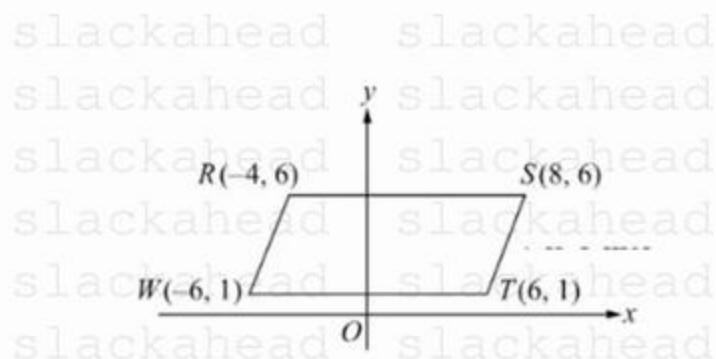
Quantity A $m+n$ **Quantity B** $2k+1$

slackahead

slackahead

slackahead

slackahead



Quantity A
quadrilateral RSTW shown in the
xy-plane

Quantity

The operation Δ is defined by $n \Delta = (n - 1)^2$ for all numbers n .

Quantity A

$$\frac{(a+1)^{\triangle}}{a^2}$$

Quantity B

1

The operation Δ is defined by $n^{\Delta} = (n - 1)^2$ for all numbers n .

r is a positive integer, $k=2r+1$, and $h=5k-3$

Quantity A

The units digit of h

Quantity B

2



10.

slackahead slackahead slackahead slackahead

If an integer is chosen at random from the integers between 101 and 550, inclusive, what is the probability that the chosen integer will begin with the digit 1, 2 or 3, and end with the digit 4, 5, or 6?

 0.02 0.05 0.10 0.15 0.20

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

 5n+35

slackahead slackahead slackahead slackahead

 7n-15

slackahead slackahead slackahead slackahead

 9n-10

slackahead slackahead slackahead slackahead

 9n+35

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

 4 5 6 7 8

11.

A customer purchased n items at Store F. If 5 of the n items cost \$7 each and the remaining items cost \$9 each, then in terms of n , what was the total cost, in dollars, of the items purchased by the customer at Store F?

slackahead slackahead slackahead slackahead

12.

If r and t are each positive integers less than 10, how many different ordered pairs (r, t) exist such that $7r+7t$ is a square of an integer?

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead



13.

Last year the value of one share of a certain stock increased by 10 percent from January to June, and the value of one share of the stock increased by 50 percent from January to December. What was the percent increase in the value of one share of the stock from June to December of last year?

Give your answer to the nearest whole percent.

 %

14.

Inventory of 500 Vehicles at a Car Dealership.
Number of Vehicles by Type and Color

Vehicle Type	Vehicle Color						Total	
	Black	Brown	Green	Red	Silver	White		
Sedan	4-door	25	34	42	33	30	36	200
	2-door	20	8	18	22	17	15	100
Specialty Vehicle	Minivan	12	6	10	10	8	14	60
	Sport-utility	12	16	22	9	3	18	80
	Station wagon	12	12	13	6	3	14	60
Total		81	76	105	80	61	97	500

For how many of the five vehicle types is the number of silver vehicles less than 20 percent of the total number of vehicles of that type?

One

Two

Three

Four

Five

15.

Inventory of 500 Vehicles at a Car Dealership.
Number of Vehicles by Type and Color

Vehicle Type	Vehicle Color						Total	
	Black	Brown	Green	Red	Silver	White		
Sedan	4-door	25	34	42	33	30	36	200
	2-door	20	8	18	22	17	15	100
Specialty Vehicle	Minivan	12	6	10	10	8	14	60
	Sport-utility	12	16	22	9	3	18	80
	Station wagon	12	12	13	6	3	14	60
Total		81	76	105	80	61	97	500

By approximately what percent does the total number of green vehicles exceed the total number of brown vehicles?

25%

29%

33%

38%

46%



16.

Inventory of 500 Vehicles at a Car Dealership.
Number of Vehicles by Type and Color

Vehicle Type	Vehicle Color						Total	
	Black	Brown	Green	Red	Silver	White		
Sedan	4-door	25	34	42	33	30	36	200
	2-door	20	8	18	22	17	15	100
Specialty Vehicle	Minivan	12	6	10	10	8	14	60
	Sport-utility	12	16	22	9	3	18	80
	Station wagon	12	12	13	6	3	14	60
Total		81	76	105	80	61	97	500

For the 5 vehicle types and 6 vehicle colors, what is the average (arithmetic mean) number of vehicles per type per color, rounded to the nearest whole number?

 17 33 45 83 100

17.

What's the remainder when 3^{73} is divided by 5?

18.

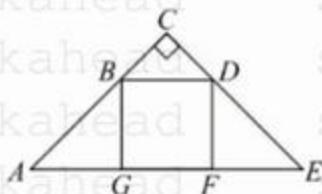


A certain closed curve consists of n semicircles having the same radius of $\frac{r}{n}$ together with a larger semicircle having a radius of r . The n semicircles are aligned along the diameter of the larger semicircle as indicated in the figure for $n=7$. The area of the region enclosed by the curve, in terms of n , and r , is which of the following?

 $\frac{\pi r^2}{2} \left(1 - \frac{1}{n}\right)$ $\frac{\pi r^2}{2} \left(1 - \frac{2}{n}\right)$ $\frac{\pi r^2}{2} \left(1 - \frac{8}{n}\right)$ $\frac{\pi r^2}{2} \left(1 - \frac{1}{2n}\right)$ $\frac{\pi r^2}{2} \left(1 - \frac{1}{4n}\right)$



19.



Square BDFG is inscribed in isosceles triangle ACE. If the area of triangular region ACE is 1, what is the area of triangular region BCD?

- slackahead
- slackahead $\frac{1}{4}$
- slackahead $\frac{1}{5}$
- slackahead $\frac{1}{6}$
- slackahead $\frac{1}{8}$
- slackahead $\frac{1}{9}$
- slackahead

20.

If $\sqrt{108} = a\sqrt{b}$, then the sum of a and b could be (a and b are both positive integers)?

Indicate all such numbers.

- slackahead
- slackahead
- slackahead
- slackahead 9
- slackahead 15
- slackahead 29
- slackahead 45
- slackahead 109



Section 3 Research

1.

The width of rectangle A is 9, and its area is 90.

Quantity A
The length of rectangle A

Quantity B
The width of rectangle B

E

2.

$$\frac{6}{1.8} = \frac{z}{0.9}$$

Quantity A

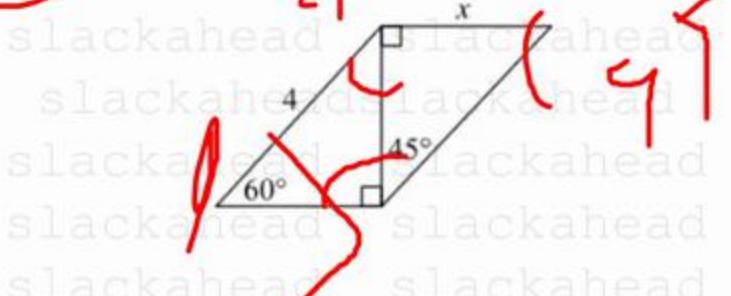
z

3.8

Quantity B

B

3.

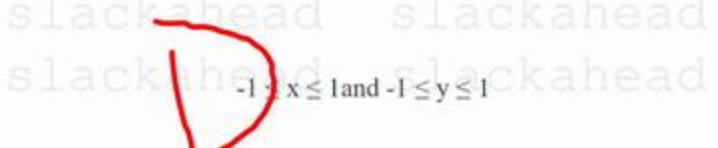


Quantity B

Quantity A

x

4.



Quantity A

$$(x + y)^2$$

Quantity B

$$xy^2$$



5

slackah The area

6

List K consists of 20 consecutive odd integers, list L consists of 20 consecutive even integers, and list M consists of 20 consecutive multiples of 3. The least integer in L is 9 greater than the greatest integer in K, and the greatest integer in L is 10 greater than the least integer in M.

Quantity A

The area of the floor, in square yards

Quantity_B

30

Quantity A

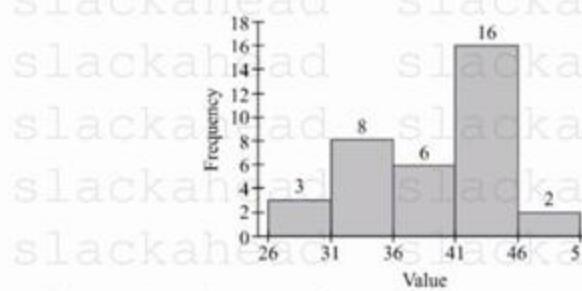
The range of the integers in K and L combined

Quantity_B

The range of the integers in L and M combined

- Quantity A is greater.
 - Quantity B is greater.
 - The two quantities are equal.
 - The relationship cannot be determined from the information given.

7.



Data set D consists of 35 values, all of which are integers. The frequency distribution of the values in D is shown in the histogram where each interval shown contains values that are greater than or equal to the left endpoint but less than the right endpoint.

Quantity A

The average (arithmetic mean) of the values in D

Quantity B

The median of the values in D



8.

Jayden, Kenny and Laina are paid hourly wages at their jobs. Jayden's hourly wage is between \$8.00 and \$9.00, Kenny's hourly wage is \$5.00 less than 2 times Jayden's hourly wage, and Laina's hourly wage is \$1.00 more than Jayden's hourly wage. Which of the following shows Jayden, Kenny, and Laina listed in order according to their hourly wages, from least to greatest?

 Ⓐ Jayden, Kenny, Laina Ⓑ Jayden, Laina, Kenny Ⓒ Kenny, Jayden, Laina Ⓓ Kenny, Laina, Jayden Ⓔ Laina, Kenny, Jayden

9.

An isosceles triangle has sides of length x , $2x$ and $2x$. If the area of the triangle is $25\sqrt{15}$, what is the value of x ?

 Ⓐ $\sqrt{10}$ Ⓑ $2\sqrt{15}$ Ⓒ $10\sqrt{15}$ Ⓓ 5 Ⓔ 10



10.

If a , b and c are integers such that $0 < a < b < c < 2a$, what is the greatest common factor of 84^a , 126^b , and 98^c ?

O $(2^a)(7^a)$

O $(2^b)(7^a)$

O $(2^b)(7^c)$

O $(2^a)(3^a)(7^a)$

O $(2^b)(3^b)(7^a)$

11.

Let n be an integer greater than 30. When n is divided by 12, the remainder is 11. What is the remainder when $(6n+1)$ is divided by 9?

12.

$a_1, a_2, a_3, \dots, a_{150}$

The n^{th} term if the sequence shown is defined for each integer n from 1 to 150 as follows. If n is odd, then $a_n = \frac{(n+1)}{2}$, and if n is even, then $a_n = (a_{n-1})^2$. How many integers appear in the sequence twice?

O 10

O 11

O 12



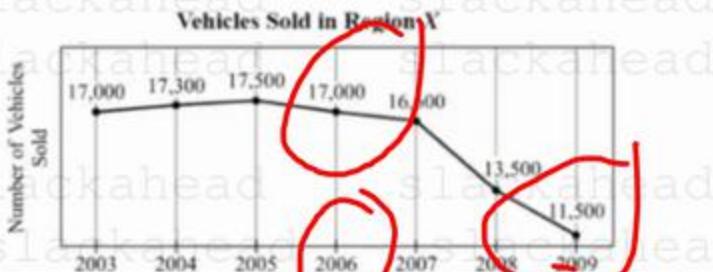
13.

Temperature C in degree Celsius and the corresponding temperature F in degrees Fahrenheit are related by the equation $F = \frac{9}{5}C + 32$. At a certain time at a weather station, the temperature in degrees Fahrenheit was equal to $\frac{1}{5}$ of the temperature in degrees Celsius. What was the temperature in degrees Fahrenheit?

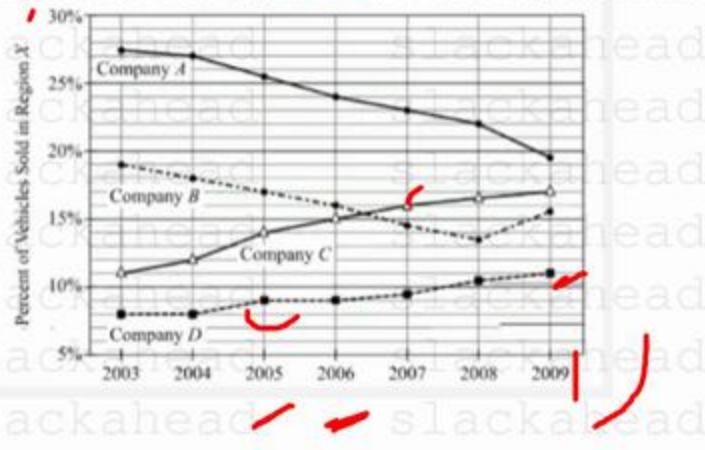
$-\text{ }^{\circ}\text{F}$

14.

Annual Vehicle Sales Data for Region X, 2003–2009



Market Share for Four Companies that Sold Vehicles in Region X



The total number of vehicles sold in Region X by companies other than A, B, C and D in 2009 was approximately how much less than that in 2006?

930

1380

1870

3640

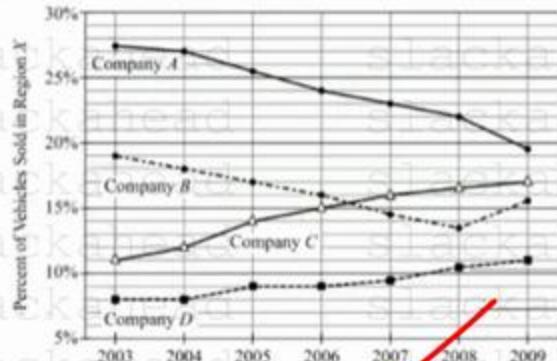
5500



15.



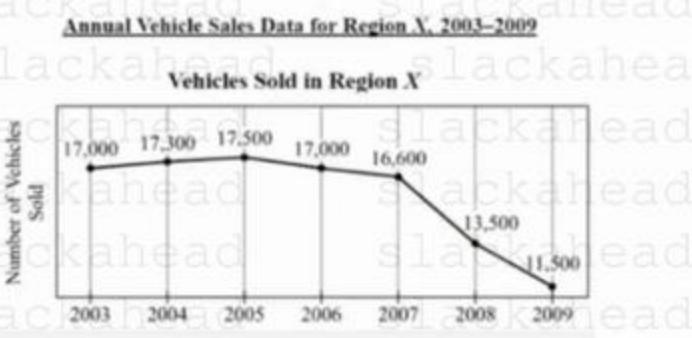
Market Share for Four Companies that Sold Vehicles in Region X



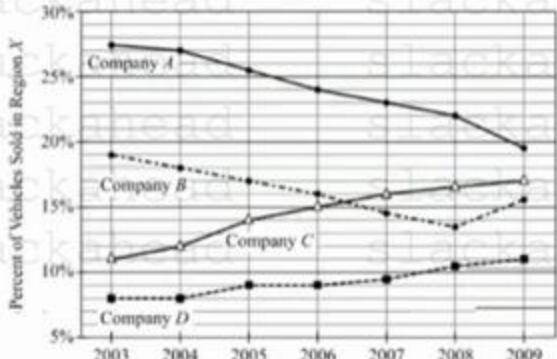
For which of the last five years shown was the difference between the annual number of vehicles sold by Company C and the annual number of vehicles sold by Company D least?

- 2005
- 2006
- 2007
- 2008
- 2009

16.



Market Share for Four Companies that Sold Vehicles in Region X



The increase in the number of vehicles sold in Region X from 2002 to 2003 was the same as that from 2003 to 2004. The decrease in the number of vehicles sold in Region X from 2009 to 2010 was the same as that from 2008 to 2009. For the years from 2002 to 2010, the median number of vehicles sold annually was approximately how much greater than the average (arithmetic mean) number of vehicles sold annually?

Give your answer to the nearest 100 vehicles.

✓ 1550



17.

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

Let S and T be two sets such that the ratio of the number of elements in S to the number of elements in T to the number of elements in the set $S \cap T$ is 4 to 3 to 1. If the sum of the number of elements in S but not in T and the number of elements in T but not in S is 2520, what is the number of elements in $S \cap T$?

slackahead

18.

slackahead

slackahead

slackahead

slackahead

A pump delivered water to fill an empty swimming pool. The pump delivered the water at a constant rate of 450 liters per minute until the pool was $\frac{1}{2}$ full. Then the pump became partially clogged and delivered the water at a slower constant rate until the pool was full.

For the whole time during which the pump delivered water to fill the empty pool, its average rate was 360 liters per minute. What was the pump's slower constant rate, in liters per minute?

slackahead

 270 288 300 400 405

slackahead

 4 to $\sqrt{3}$ $\sqrt{3}$ to 1 $\sqrt{3}$ to 2

19.

slackahead



20.

slackahead

slackahead

slackahead

slackahead

The standard deviation of n numbers $x_1, x_2, x_3, \dots, x_n$, with mean \bar{x} is equal to $\sqrt{\frac{s}{n}}$, where S is the sum of the squared differences $(x_i - \bar{x})^2$ for $1 \leq i \leq n$.

If the standard deviation of the 5 numbers 20-2c, 20-c, 20, 20+c, and 20+2c is greater than 6, which of the following could be the value of c?

slackahead

slackahead

slackahead

slackahead

Indicate all such values.

slackahead

Section 4 Medium

slackahead

slackahead

slackahead

1. slackahead

slackaheads

slackahead

Quantity A

$$\frac{5^2}{5^2}$$

Slackahead

Quantity B

$$\frac{1}{5}$$

slackahead



2

The centers of the five smaller circles all lie on segment AB, which is a diameter of the largest circle, and each circle is tangent to two of the other circles.

Quantity A

The circumference of the largest circle

Quantity B

The sum of the circumferences of the five smaller circles

3

Quantity A

x = 3

$$|x-3| = y, \text{ where } x < 3$$

Quantity B

v

1

List A consists of n integers and list B consists of k integers. The average (arithmetic mean) of the integers in list A is less than the average of the integers in list B. The sum of the integers in list A is 524 and the sum of the integers in list B is 565.

Quantity A

11

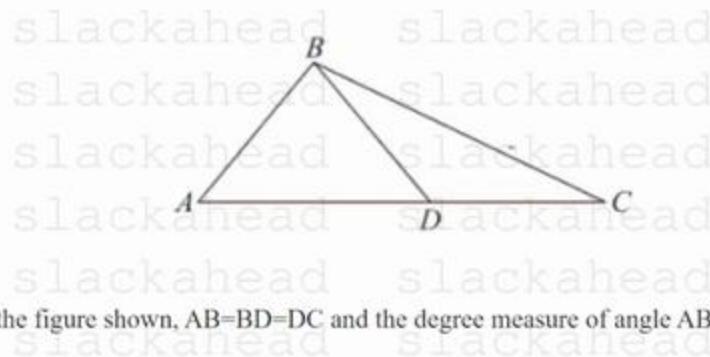
Quantity B

k



5.

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead



In the figure shown, $AB=BD=DC$ and the degree measure of angle ABD is 80.

Quantity A

The degree measure of angle DBC

Quantity B

Quantity B

30

6.

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

Quantity A

$$\frac{x^{-1}}{y^{-1}}$$

Quantity B

Quantity B

$$\frac{x}{y}$$

slackahead
slackahead
slackahead
7.

Today a certain machine is worth 20 percent less than it was worth a year ago, and it is worth x percent less than it was worth two years ago. A year ago the machine was worth 20 percent less than it was worth two years ago.

Quantity A

x

Quantity B

Quantity B

40

slackahead
slackahead
slackahead
8.

Quantity A

$$\frac{100!}{99!}$$

Quantity B

Quantity B

$$\frac{(100! - 99!)}{98!}$$



9.

slackahead

1 cup=8 ounces

slackahead

1 pint=2 cups

slackahead

1 quart=2 pints

slackahead

A large coffee jug contains 3 quarts, 1 pint, and 1.5 cups of coffee. What is the greatest number of 12-ounces mugs of coffee that can be filled from the jug?

slackahead

slackahead 6 slackahead

slackahead

slackahead 9 slackahead

slackahead

slackahead 10 slackahead

slackahead

slackahead 12 slackahead

slackahead

slackahead 15 slackahead

slackahead

slackahead slackahead

slackahead

slackahead slackahead

slackahead

slackahead slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

10.

slackahead

slackahead slackahead slackahead

slackahead

If the average (arithmetic mean) of the list of positive integers 2, x, y and 7 is 3, then the median of the list of integers is?

slackahead

slackaheads slackahead

slackahead

slackahead

slackahead slackahead

slackahead

slackahead

slackahead 1 slackahead

slackahead

slackahead

slackahead 2 slackahead

slackahead

slackahead

slackahead 3 slackahead

slackahead

slackahead

slackahead 4 slackahead

slackahead

slackahead

slackahead 5 slackahead

slackahead

slackahead

slackahead slackahead

slackahead

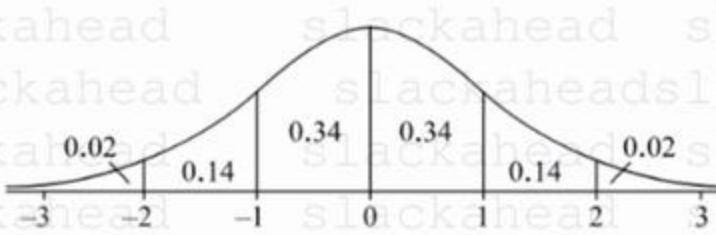


11



The shaded triangle in the xy -plane above is bounded by the x -axis and the graphs of $y = -x + 3$ and $y = (\frac{3}{2})x + 3$. What is the area of the triangle?

12



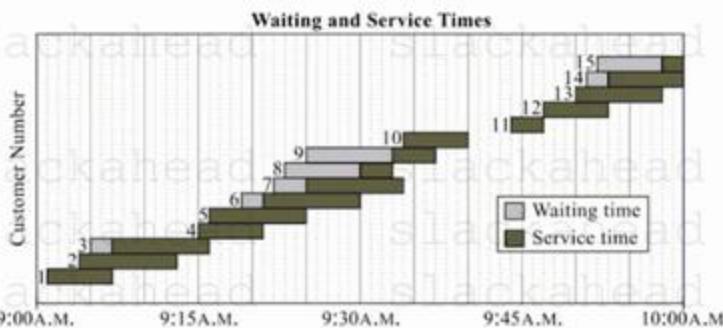
The random variable X has the standard normal distribution with a mean of 0 and a standard deviation of 1, as shown. Probabilities, rounded to the nearest 0.01, are indicated for the six intervals shown. The random variable Y has a normal distribution with a mean of 2 and a standard deviation of 1. Using the probabilities shown, approximately how much greater is the probability that the value of Y is between 1 and 2 than the probability that the value of X is between 1 and 2?

○ 0.14
○ 0.20
○ 0.34



16.

Each of the 15 customers who arrived at a customer service desk between 9 AM and 10 AM was served in order of arrival by one of the two customer service representatives. Each representative served one customer at a time and finished with that customer before serving any other customers. The graph shows the waiting and service times, recorded to the nearest minute, for customers numbered 1 to 15.



17.

In a certain sequence of numbers, the 1st term is equal to 1 and each term after the 1st term is equal to 12 times the square of the preceding term. If the 5th term of the sequence is equal to 12ⁿ, what is the value of n?

18.

The operation $a \heartsuit b$ is defined for all numbers a and b by $a \heartsuit b = a + 3b + 6$. If $c \heartsuit c = c$, what is the value of c?

slackahead

What was the range of the recorded service times, in minutes, for the 15 customers?

 4 6 7 9 14 0 $\frac{3}{2}$



19.

A certain store sells circular rugs at a constant price per square foot. If a circular rug with diameter 5 feet costs \$250, what is the cost of a circular rug with diameter 9 feet?

\$450

\$810

\$900

\$1620

\$1800

20.

A company has assets worth \$150,000 and liabilities worth \$70,000, giving it an asset-to-liability ratio of approximately 2.1. The company will borrow x dollars, and the amount borrowed will be added to both the assets and the liabilities. If the asset-to-liability ratio is to be greater than 1.2 after the money is borrowed, which of the following could be the value of x ?

Indicate all such values.

300,000

320,000

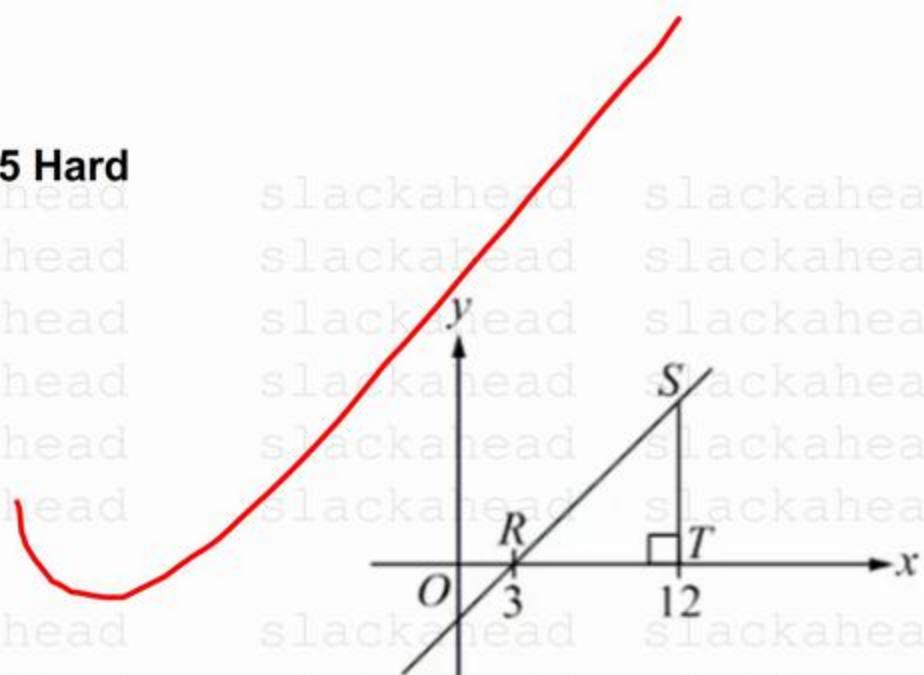
340,000

360,000



Section 5 Hard

1



In the xy -plane, the equation of line RS is $y=x-3$.

x and y are prime numbers

$$x < y$$

Quantity A

X

Quantity B

3

3

When the total cost of 90 dollars for the rental of a van was evenly divided among n passengers, the cost to each passenger was less than 23 dollars.

Quantity A

11

Quantity B

5

4

Quantity A

$\frac{1}{5}$ percent of 59

Quantity B

0.2



5

$$(x-3)(x+3) = (2x-1)$$

Quantity A

3

Quantity B

10

6.

Quantity A

The distance between P and Q

Quantity B

The distance between Q and R

7

A box manufacturer is designing a closed box in the shape of a rectangular solid. The ratio of the lengths of the sides of the box is 1 to 2 to 3. The total surface area of the box is 550 square inches. What is the volume of the box, in cubic inches?

A 500

B 625

C 750

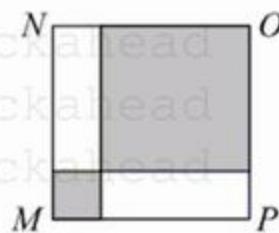
D 875

E 1250



8.

In square MNOP shown, the two shaded square regions have areas in the ratio 9 to 1. If square region MNOP has area 144, what is the area of each of the two unshaded rectangular regions?



9.

In square MNOP shown, the two shaded square regions have areas in the ratio 9 to 1. If square region MNOP has area 144, what is the area of each of the two unshaded rectangular regions?

9
 16
 27
 36
 48



12.

Flavor	Number
Caramel	1
Orange cream	2
Vanilla	4
Cherry	5

A box contains 12 candies of four different flavors. The table above shows the numbers of candies of each flavor. If 2 candies are to be selected at random from the box, without replacement, what is the probability that of the 2 candies selected one will be a caramel candy and the other will be a cherry candy?

- $\frac{5}{12}$
 $\frac{5}{22}$
 $\frac{5}{24}$
 $\frac{5}{33}$
 $\frac{5}{66}$

13.

$$Z = 123^4 - 123^3 + 123^2 - 123$$

What is the remainder when Z is divided by 122?

- 0
 1
 2
 3
 4



14.

Number of Motor Vehicles Owned by a Random Sample of 900 Families

Number of Motor Vehicles Owned	Number of Families
At least 1	900
At least 2	610
At least 3	250
More than 3	75

slackahead

Approximately what percent of the families in the sample own more than 3 motor vehicles?

- 2.8%
- 3.5%
- 4.2%
- 8.3%
- 27.5%

15.

Number of Motor Vehicles Owned by a Random Sample of 900 Families

Number of Motor Vehicles Owned	Number of Families
At least 1	900
At least 2	610
At least 3	250
More than 3	75

slackahead

- How many of the families own exactly 2 motor vehicles?
- 610
 - 360
 - 285
 - 250
 - 175

16.

Number of Motor Vehicles Owned by a Random Sample of 900 Families

Number of Motor Vehicles Owned	Number of Families
At least 1	900
At least 2	610
At least 3	250
More than 3	75

If a family were selected at random from the survey sample, what is the probability that the family would own more than 2 motor vehicles?

- $\frac{5}{18}$
- $\frac{13}{36}$
- $\frac{2}{5}$
- $\frac{3}{5}$
- $\frac{61}{90}$



17.

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

If a , b , and c are positive integers such that $\frac{a}{c}=0.075$, and $\frac{b}{c}=0.09$, What is the least possible value of c ?

slackahead

o 4

o $4\frac{1}{2}$

o 6

19.

slackahead

o 4

o $4\frac{1}{2}$

o 6



20.

Number of Tickets	Cost
1	\$1.25
10	\$11.00
20	\$20.00

slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead

Tickets for a carnival are sold either individually or in packages of 10 tickets or 20 tickets at the costs shown in the table. A group of friends bought n tickets for the least possible total cost. A second group of friends bought more than n tickets for a total cost that was less than the first group's total cost. Which of the following could be the value of n ?

Indicate all such values.

- slackahead 8 slackahead slackahead slackahead
slackahead 9 slackahead slackahead slackahead
slackahead 11 slackahead slackahead slackahead
slackahead 12 slackahead slackahead slackahead
slackahead 16 slackahead slackahead slackahead
slackahead 17 slackahead slackahead slackahead
slackahead 18 slackahead slackahead slackahead
slackahead 19 slackahead slackahead slackahead

slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead
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slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead

Section 6 Medium

slackahead

1.

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

Quantity A

$$|x-y|$$

Quantity B

3

x and y are positive integers

$$x^2 + y^2 = 89$$

$$xy = 40$$



2.

slackahead

slackahead

slackahead

slackahead

The average (arithmetic mean) of 20 numbers is 53. When one of the numbers is discarded, the average (arithmetic mean) of the remaining numbers is 54.

Quantity A

The discarded number

Quantity B

50

3.

slackahead

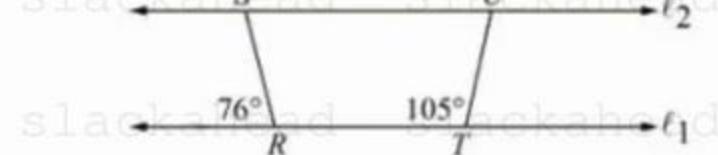
Quantity A

x

Quantity B

2

a is a positive integer.

x is the remainder when $15a$ is divided by 6



6.

When testing a series of bottles of water, chemical A is found in 52% of all bottles, chemical B is found in 18% of all bottles, while chemical A and B are found in 10% of all bottles.

Quantity A

The proportion of bottles that contain neither chemical A nor chemical B

Quantity B

34%

7.

$$5(x-y+20) = y+100$$

Quantity A

$$\frac{x}{y}$$

Quantity B

1

8.

n is a negative integer, and $ab=1$

Quantity A

$$a^n$$

Quantity B

$$b^n$$

9.

If k , n and p are consecutive positive even integers and $k < n < p$, which of the following must be an integer?

$$\textcircled{O} \frac{k+n+p}{4}$$

$$\textcircled{O} \frac{k+n+p}{6}$$

$$\textcircled{O} \frac{k+n+p}{9}$$

$$\textcircled{O} \frac{k+n+p}{10}$$

$$\textcircled{O} \frac{k+n+p}{15}$$



10.

In a certain club, 40 percent of the members are less than 25 years old and 66 percent of the members are less than 35 years old.

Approximately what fraction of the members of the club are at least 25 years old but less than 35 years old?

- slackahead $\frac{1}{2}$
- slackahead $\frac{1}{3}$
- slackahead $\frac{1}{4}$

- slackahead $\frac{1}{5}$
- slackahead $\frac{1}{6}$

- slackahead $\frac{t-13}{(30)(13)}$

$$\frac{(t-13)(13)}{30}$$

$$\frac{(t-13)(30)}{13}$$

$$\frac{(30)(13)}{t-13}$$

$$\frac{30}{(13)(t-13)}$$

11.

On a trip, Marie drove the first half of the distance at an average speed of 30 miles per hour for a total of 13 hours of driving, and Juanita will drive the second half of the trip. They scheduled t hours driving for the entire distance. If they are to arrive exactly on schedule, at what average speed must Juanita drive the second half of the distance?

12.

In the rectangular coordinate system, a certain line has slope 3. Which of the following pairs of points could be on the line?

slackahead $(-1, 2)$ and $(-2, 5)$

slackahead $(0, 1)$ and $(3, 2)$

slackahead $(0, 1)$ and $(3, 4)$

slackahead $(3, 1)$ and $(4, 4)$

slackahead $(3, 1)$ and $(5, 6)$



13.

As a part of an environmental study of a river, a random sample of trout was drawn from the river and the lengths of the trout were recorded. The average (arithmetic mean) length was 14.31 inches. If a length of 16.89 inches was 1.50 standard deviations above the average, what was the standard deviation of the lengths of the trout in the sample?

14.

Faculty at University X by Age and Rank

Age	Rank				Total
	Full Professor	Associate Professor	Assistant Professor	Instructor	
Under 30	4	6	114	12	136
30-39	250	104	326	34	714
40-49	340	312	122	12	786
50-59	136	290	72	8	506
60 or older	150	30	6	2	188
Total	880	742	640	68	2,330

For which of the age-groups is the ratio of the number of full professors to the number of associate professors the greatest?

- Under 30
- 30-39
- 40-49
- 50-59
- 60 or older

Faculty in the Fine Arts Department at University X Distributed by Rank



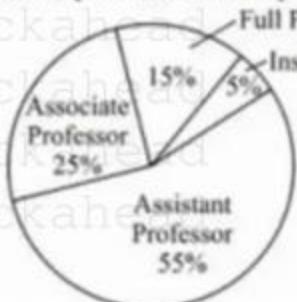
Total Fine Arts Faculty: 120



15.

Faculty at University X by Age and Rank

Age	Rank				Total
	Full Professor	Associate Professor	Assistant Professor	Instructor	
Under 30	4	6	114	12	136
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50-59	136	290	72	8	506
60 or older	150	30	6	2	188
Total	880	742	640	68	2,330

Faculty in the Fine Arts Department at University X Distributed by Rank

Total Fine Arts Faculty: 120

slackahead

slackahead

If 10 percent of all the faculty members under 40 at University X are in the fine arts department, approximately what percent of the faculty members in the fine arts department are under 40?

 75% 70% 60% 45% 30%



16.

Faculty at University X by Age and Rank

Age	Rank				Total
	Full Professor	Associate Professor	Assistant Professor	Instructor	
Under 30	4	6	114	12	136
30-39	250	104	326	34	714
40-49	340	312	122	12	786
50-59	136	290	72	8	506
60 or older	150	30	6	2	188
Total	880	742	640	68	2,330

Faculty in the Fine Arts Department at University X Distributed by Rank

Total Fine Arts Faculty: 120

17.

The units digit of 7^{34} is x, and the units digit of 6^{34} is y. What is the value of the product xy?



$y < x$
 $y = rs$
 $z = rxy$

If r , s , x , y and z are positive even integers that are related by the system shown, what is the median of the integers r , s , x , y and z ?

19.

If an equilateral triangle with sides of length 20 has an altitude of length $20x$, then $x=?$



20.

Mr. Thomas gave a chemistry test to 25 students and assigned each student a score. Of the 25 students, 12 students received scores that were greater than 80.

Which of the following statements individually provide(s) sufficient additional information to determine the median of the 25 scores?

Indicate all such statements.

- The average (arithmetic mean) of the 25 scores was 80
- One students received a score of 80
- Twelve students received scores that were less than or equal to 75

Section 7 Hard

1.

After a bird feeder was filled with x pounds of birdseed, 12 ounces of birdseed were consumed each day for the next 8 days. (1 pound = 16 ounces)

At the end of the 8 days, the weight of the birdseed in the bird feeder that was not consumed

Quantity B
 $x - 5$ pounds

2.

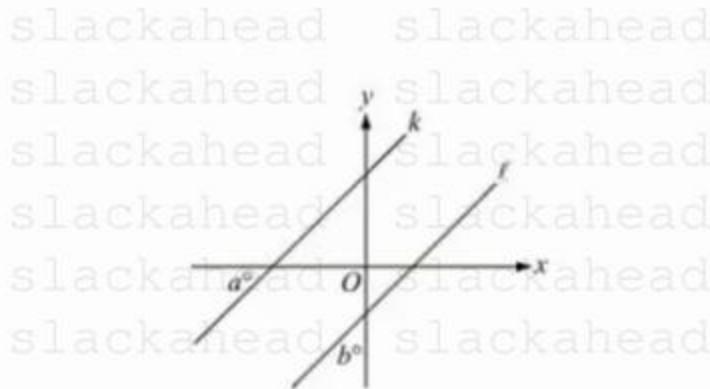
$|a|=4$ and $|b|=6$

Quantity A
 $|a+b|$

Quantity B
5



7



8.

List L consists of r values, and the average (arithmetic mean) of the values in L is 52.8. List M consists of s values, and the average of the values in M is 54.2. List K consists of the values in L and the values in M.

Quantity A

3

Quantity_B

b

Quantity A

The average of the values in K

Quantity R

535

9

Paul's family put m dollars in a new savings account on May 2, 1990, and put the same number of dollars in the account on May 2, 1991, and again on May 2, 1992. If the annual interest rate on this account was 4 percent compounded annually and there were no other deposits to the account or withdrawals from the account, which of the following represents the total number of dollars in the account on May 2, 1993, just after interest had been compounded for the third time, in terms of m ?

© m(1.04)

3m(1.04)

$\odot m(1.04) \times 3m(1.04) \times 3m(1.04)$

$$\odot m(1.04) + m(1.04)^2 + m(1.04)^3$$

$$\supset m(1.04) + m^2(1.04)^3 + m^3(1.04)^3$$



10.

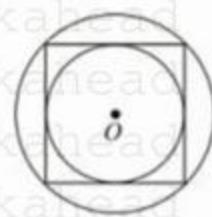
The integer k is the product of four different prime numbers. If the result when k is divided by 10 is a multiple of 11, which of the following could be the result when k divided by 5?

 50 55 66 121 198

11.

Three variables, x , y , and z , in a scientific experiment are related by the equation $z = x^2y$. In the experiment, if the value of x decreases by 40 percent while the value of y increases by 50 percent, what is the percent decrease in the value of z ?

 10% 18% 24% 36% 46%

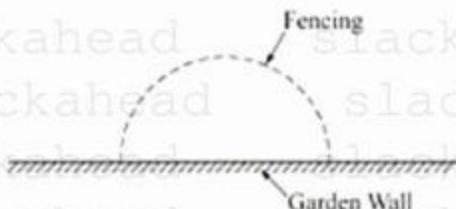


The two circles in the figure above both have center O. The square is inscribed in the larger circle and circumscribed about the smaller circle. If x is the radius of the larger circle, what is the area of the smaller circle, in terms of x?

- $\frac{3\pi x^2}{4}$
- $\frac{2\pi x^2}{3}$
- $\frac{\pi x^2}{2}$
- $\frac{\pi x^2}{3}$
- It cannot be determined

It cannot be determined from the information given.

13.



The figure above represents a semicircular garden that is enclosed by 20 feet of fencing and a straight garden wall. What is the area, in square feet, of the garden?

400/ π



14.

Percent of Country M's Population by Region and Blood Type
Blood Type

	O-Rh ⁺	O-Rh ⁻	A-Rh ⁺	A-Rh ⁻	B-Rh ⁺	B-Rh ⁻	AB-Rh ⁺	AB-Rh ⁻	Total
<i>R₁</i>	4.8	0.8	5.7	1.0	1.1	0.2	1.3	0.1	15.0
<i>R₂</i>	15.4	1.2	14.2	1.4	1.6	0.8	1.1	0.1	35.8
<i>R₃</i>	14.1	2.5	15.3	2.4	4.0	0.7	0.7	0.2	39.9
<i>R₄</i>	1.0	0.6	2.6	0.8	0.8	0.5	0.3	0.1	6.7
<i>R₅</i>	0.8	0.3	0.9	0.2	0.1	0.1	0.2	*	2.6
Total	36.1	5.4	38.7	5.8	7.6	2.3	3.6	0.5	100.0

Total Population of Country M: 2,011,000

*less than 0.05

If a person is randomly chosen from Country M, approximately what is the probability that the person will have one of the two most common of the eight blood types?

- $\frac{7}{8}$
- $\frac{4}{5}$
- $\frac{3}{4}$

- $\frac{5}{8}$
- $\frac{3}{5}$

In region *R₃*, for how many of the eight blood types are there fewer than 100,000 people with that blood type?

- Two
- Three
- Four

- Five
- Six

Approximately how many people who live in region *R₄* have blood type B-Rh⁺?

- 400,000
- 160,000
- 40,000
- 16,000
- 4,000

15.

Percent of Country M's Population by Region and Blood Type
Blood Type

	O-Rh ⁺	O-Rh ⁻	A-Rh ⁺	A-Rh ⁻	B-Rh ⁺	B-Rh ⁻	AB-Rh ⁺	AB-Rh ⁻	Total
<i>R₁</i>	4.8	0.8	5.7	1.0	1.1	0.2	1.3	0.1	15.0
<i>R₂</i>	15.4	1.2	14.2	1.4	1.6	0.8	1.1	0.1	35.8
<i>R₃</i>	14.1	2.5	15.3	2.4	4.0	0.7	0.7	0.2	39.9
<i>R₄</i>	1.0	0.6	2.6	0.8	0.8	0.5	0.3	0.1	6.7
<i>R₅</i>	0.8	0.3	0.9	0.2	0.1	0.1	0.2	*	2.6
Total	36.1	5.4	38.7	5.8	7.6	2.3	3.6	0.5	100.0

Total Population of Country M: 2,011,000

*less than 0.05

16.

Percent of Country M's Population by Region and Blood Type
Blood Type

	O-Rh ⁺	O-Rh ⁻	A-Rh ⁺	A-Rh ⁻	B-Rh ⁺	B-Rh ⁻	AB-Rh ⁺	AB-Rh ⁻	Total
<i>R₁</i>	4.8	0.8	5.7	1.0	1.1	0.2	1.3	0.1	15.0
<i>R₂</i>	15.4	1.2	14.2	1.4	1.6	0.8	1.1	0.1	35.8
<i>R₃</i>	14.1	2.5	15.3	2.4	4.0	0.7	0.7	0.2	39.9
<i>R₄</i>	1.0	0.6	2.6	0.8	0.8	0.5	0.3	0.1	6.7
<i>R₅</i>	0.8	0.3	0.9	0.2	0.1	0.1	0.2	*	2.6
Total	36.1	5.4	38.7	5.8	7.6	2.3	3.6	0.5	100.0

Total Population of Country M: 2,011,000

*less than 0.05



17.

slackahead

slackahead

slackahead

slackahead

If the sum of two numbers is 9, what is the greatest possible value of the product of the two numbers?

Give your answer as a decimal.

slackahead

18.

slackahead



20.

In the four quarters of 2013, denoted by Q1, Q2, Q3 and Q4, Company C hired the same number of employees in Q2 as in Q1 and twice as many employees in Q3 as in Q2. The number of employees hired by the company in Q4 was greater than the number of hired in Q3; however, the number hired in Q4 was also less than 3 times the number hired in Q3. All of the employees were hired only once.

If an employee is to be selected at random from all the employees hired during the four quarters, which of the following values could be the probability that the employee will be one who was hired in Q4?

Indicate all such values.

slackahead

slackahead

slackahead

slackahead $\frac{1}{3}$

slackahead $\frac{3}{8}$

slackahead $\frac{5}{12}$

slackahead $\frac{1}{2}$

slackahead $\frac{11}{20}$

slackahead $\frac{3}{5}$

slackahead



2.

slackahead

slackahead

1, 2, 4, 8, 16.....

slackahead

slackahead

slackahead

The first five terms of an infinite sequence are shown above. Each term after the first term is 2 times the preceding term.

slackahead

slackahead

slackahead

slackahead

n is an odd integer greater than 50.

slackahead

slackahead

slackahead

slackahead

Quantity B**Quantity A**The average (arithmetic mean) of the first n terms of
the sequenceThe median (arithmetic mean) of the first n terms of
the sequence

slackahead

slackahead

slackahead

slackahead

k and n are consecutive positive odd integers.

slackahead

slackahead

slackahead

slackahead

Quantity B**Quantity A**

The least common multiple of k and n

kn

slackahead

slackahead

4. slackahead

slackahead

n > 10,000

slackahead

slackahead

Quantity AThe thousands digit of $\frac{n}{8}$ **Quantity B**

7

slackahead

slackahead

slackahead

slackahead

5. slackahead

slackahead

1 < 2x+1 < 3

slackahead

slackahead

slackahead

slackahead

Quantity A $(x^2-5)-(x-5)$ **Quantity B**

0

slackahead

slackahead

slackahead

slackahead

6. slackahead

slackahead

slackahead

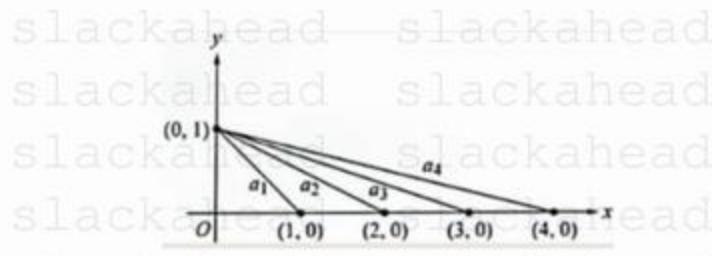
slackahead

Quantity AThe median number of days per month for a year in
which February has 28 days**Quantity B**The median number of days per month for a year in
which February has 29 days



7

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
In the sequence $a_1,$
slackahead



In the sequence a_1, a_2, a_3, \dots , the n^{th} term a_n is the distance in the xy-plane between $(0, 1)$ and $(n, 0)$ for each positive integer n . The figure shows the first four terms of the sequence.

• 18

20

Quantity A

X

Quantity_B

401

The recreation director at a local youth club surveyed the members to determine interest in two activities-a hiking trip and a softball game. Of the members surveyed, 60 percent were interested in the hiking trip and 75 percent were interested in the softball game. Of those who were interested in the softball game, $\frac{2}{3}$ were also interested in the hiking trip. What percent of the members surveyed were not interested in either of the two activities?

○ 10%

815%

250

- 350 -



10. slackahead slackahead slackahead slackahead

Stores A, B, C, and D sell a certain model of printer for the same retail price. The retail price of the printer is discounted by 10 percent, 20 percent, 16 percent, and 12 percent at Stores A, B, C, and D, respectively. If the retail price of the printer is at least \$100, which of the following statements about the discounted prices at the four stores must be true?

Indicate all such statements.

The range is at least \$10.

The median is at least \$90.

The average (arithmetic mean) is at least \$80.

11. slackahead slackahead slackahead slackahead

The total revenue that firm P receives from the sale of a particular item is determined by multiplying the number of the items it sells by the price of the item. If the price of the item is to be decreased by 20 percent, by what percent must the number of the items sold increase to keep the total revenue unchanged?

15%

20%

25%

30%

35%



15 *ackahead*

Weekly Rental Rates for Realtor M's Summer Houses on Island X

Location	Number of Bedrooms in House		
	2 Bedrooms	3 Bedrooms	4 Bedrooms
Oceanside	\$800	\$900	\$1,000
Bayside	\$600	\$700	\$800
Inland	\$500	\$600	\$700

A group of 10 couples plans to rent bayside summer houses on Island X from Realtor M for a certain week. The total rental cost for the houses will be evenly distributed among the 10 couples, and each couple will have their own bedroom. If Realtor M has at least three bayside summer houses of each type available that week, what is the least possible rental cost per couple?

- \$400

- \$300

- \$240

- \$220

- \$190

If Realtor M's inland summer houses on Island X generate a total weekly rental income of \$8,800 when they are all rented, what is the greatest possible number of inland 4-bedroom summer houses that Realtor M can have?

- 8

- o 6

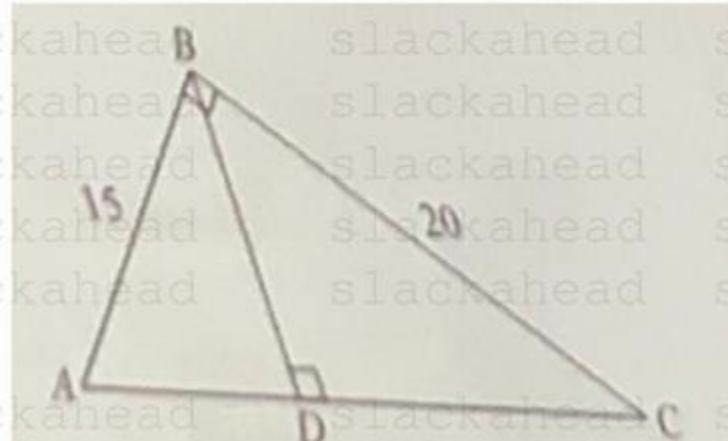
- o

- 1

- 8



17.



In the figure shown, what is the length of line segment BD?

18.

What percent of $\frac{1}{2}$ is $\frac{2}{3}$?

33 $\frac{1}{3}\%$

75%

116 $\frac{2}{3}\%$

133 $\frac{1}{3}\%$

175%



19.

If $x < y$, which of the following must be true?

- slackahead
 slackahead
 slackahead
 slackahead $\circ 2x < y$
 slackahead $\circ 2x > y$
 slackahead $\circ x^2 < y^2$

- slackahead
 slackahead
 slackahead
 slackahead $\circ 2x - y < y$
 slackahead $\circ 2x - y < 2xy$
 slackahead

- slackahead
 slackahead
 slackahead
 slackahead
 slackahead
 slackahead

20.

In the rectangular coordinate system, the point $(2, 1)$ is on a circle whose center is $(-2, -1)$. What is the circumference of the circle?

- slackahead
 slackahead
 slackahead
 slackahead $\circ 12\pi$
 slackahead $\circ 20\pi$

$$\circ 2\pi\sqrt{3}$$

- slackahead $\circ 2\pi\sqrt{5}$
 slackaheads $\circ 4\pi\sqrt{5}$

- slackahead
 slackahead
 slackahead
 slackahead
 slackahead
 slackahead

Section 9 Hard

1.

Five different families received tax bills at the beginning of the year. Later, the four lowest tax bills were each reduced by \$200 while the highest tax bill remained the same.

Quantity A

The standard deviation of the original five tax bills

Quantity B

The standard deviation of the resulting five tax bills
after the four lowest tax bills were reduced



2.

R and T are two different points in the xy-plane. The coordinates of R are (4, 5), and the slope of the line containing R and T is 3.

Quantity A

The x-coordinate of T

Quantity B

2

3.

List K consists of 100 numbers between 20 and 40, and list M consists of 200 numbers between 30 and 50.

Quantity A

The arithmetic mean of the numbers in list K

Quantity B

The arithmetic mean of the numbers in list M

4.

$$(3^{8x})(Y^3) = 3^{8x+3}$$

Quantity A

Y^2

Quantity B

9

5.

 $x > 0$ **Quantity A** $\frac{1}{9}$ of x**Quantity B**

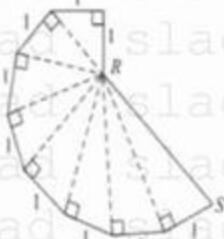
11% of x



6.

slackahead
slackahead
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slackahead slackahead
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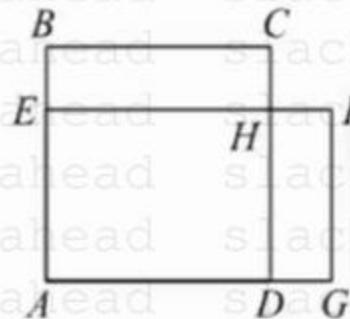


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slackahead
slackahead

slackahead
slackahead
7. slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

Quantity A
RS

slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead



Quantity B
3

slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead

slackahead
slackahead
slackahead
slackahead
8. slackahead
slackahead

The area of square ABCD

slackahead slackahead
slackaheads slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead

Quantity B

The area of rectangle AEFG

slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead

Last Saturday a cyclist started a 40-kilometer trip at 9 o'clock in the morning and rode at an average speed of 20 kilometers per hour for 45 minutes. The cyclist stopped to rest for x minutes and then rode at an average speed of 30 kilometers per hour until the trip was completed at 11 o'clock in the morning. What is the value of x?

slackahead
slackahead
slackahead
slackahead
slackahead

slackahead slackahead
slackahead slackahead
slackahead \textcircled{O}^{35} slackahead
slackahead \textcircled{O}^{25} slackahead

- 20
- 15
- 10



9

$$\begin{array}{r} YX7 \\ + 6Y \\ \hline Y7X \end{array}$$

In the sum above, if X and Y each denote one of the digits from 0 to 9, inclusive, then X=?

slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead
slackhead slackahead
slackahead slackahead

1

Carolyn took out a one-year loan for \$15,000 at 8 percent simple annual interest. She repaid the total amount, including the interest, by making 12 equal monthly payments on the last day of each month beginning in January. At the beginning of which of the following months did Carolyn have less than \$10,000 of the total amount left to be repaid?

Indicate all such months

	<input type="checkbox"/> April	
	<input type="checkbox"/> May	
	<input type="checkbox"/> June	
	<input type="checkbox"/> July	
	<input type="checkbox"/> August	
	<input type="checkbox"/> September	



11.

slackahead

12.

If set S consists of the squares of the integers from -5 to 5, inclusive, how many elements are in set S?

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

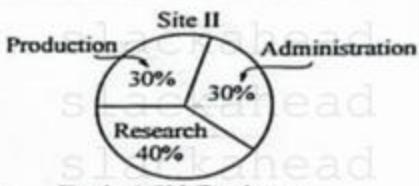
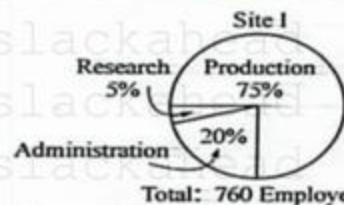
slackahead

slackahead

 5 6 10 11 25



15.

DISTRIBUTION OF EMPLOYEES OF COMPANY Y

Note: Each employee of Company Y works at one of the two sites in one of the three departments shown.

slackahead

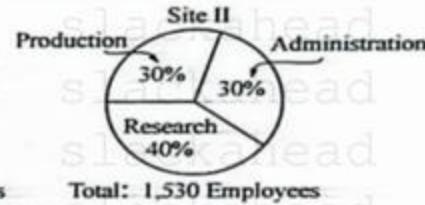
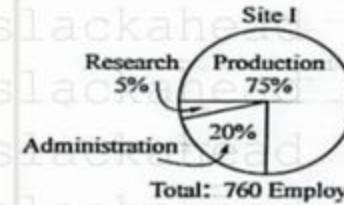
The ratio of the number of production workers at Site I to the number of production workers at Site II is mostly equal to

- 2 to 5
- 4 to 5
- 5 to 2
- 5 to 3
- 5 to 4

At Site II, if the average (arithmetic mean) salaries in production, administration, and research are x , y , and z dollars, respectively, what is the average salary, in dollars, of all employees at Site II?

- $\frac{(x+y+z)}{3}$
- $0.3x+0.3y+0.4z$
- $\frac{(0.3x+0.3y+0.4z)}{3}$
- $\frac{(0.3x+0.3y+0.4z)}{1530}$
- $(0.3)(1530)x+(0.3)(1530)y+(0.4)(1530)z$

16.

DISTRIBUTION OF EMPLOYEES OF COMPANY Y

Note: Each employee of Company Y works at one of the two sites in one of the three departments shown.

17.

The operation is defined by $x * y = \frac{x^2}{y} + \frac{x}{y}$ for all numbers x and y , where $y \neq 0$. What is the value of $(9 * (-9)) + ((-9) * 9)$?



18.

Three printers, X_1 , X_2 and X_3 , work only at their respective constant rates. Working together, X_1 , X_2 and X_3 can complete a certain job in 9 hours; working together, X_2 and X_3 can complete the same job in 12 hours. Working alone, how many hours will it take X_1 to complete the job?

- slackahead
 slackahead
 slackahead $\circ 12$
 slackahead $\circ 15$

- slackahead $\circ 18$
 slackahead $\circ 24$
 slackahead $\circ 36$
 slackahead $\circ 0.58$

- slackahead $\circ 0.75$
 slackahead $\circ 0.58+0.75$
 slackahead $\circ \frac{(0.58+0.75)}{2}$
 slackahead $\circ 0.58+0.75-(0.58)(0.75)$

19.

If the probability that event R will occur is 0.75, and the probability that event M will occur is 0.58, which of the following is equal to the maximum probability that both events will occur?

- slackahead $\circ 5, 30, 55$
 slackahead $\circ 10, 55$
 slackahead $\circ 35, 60$

20.

Let n be a nonnegative integer such that when $6n$ is divided by 75, the remainder is 30. Which of the following is a list of all possible remainders when $7n$ is divided by 75?

- slackahead $\circ 5, 35$
 slackahead $\circ 10, 55$
 slackahead $\circ 35, 60$



Section 10 Medium

slackahead

The product of the three roots

Quantity A**Quantity B**

slackahead

Quantity A

$$\frac{1}{1+\frac{1}{x}}$$

Quantity B

$$\frac{x}{x+1}$$

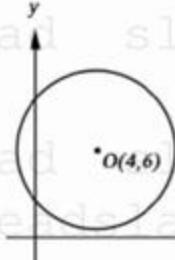
slackahead

Quantity A

The radius of the circle

Quantity B

6



(4, 6) is the center of the circle above.

4.

slackahead

|x| ≤ 6 and |y| ≤ 4

slackahead

slackahead

slackahead

x and y are integers, where x ≠ 0. M is the greatest possible value of $|\frac{y}{x}|$.**Quantity A**

M

Quantity B

1



5.

slackahead

slackahead slackahead

The function f is defined for all numbers x by $f(2x) = x^2 - 2x + 8$.

slackahead

slackahead

slackahead

slackahead

Quantity A $f(6)$

slackahead

slackahead

Quantity B

12

slackahead

slackahead

slackahead

slackahead

6.

slackahead

 $x \neq -2$

slackahead

Quantity A $(x+2)x$

slackahead

slackahead

Quantity B $(x+2)(x-2)$

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

Quantity A $2r$

slackahead

slackahead

Quantity B $\frac{1}{r}$

slackahead

slackahead

8.

In a competition, a certain contestant scored either 2 points or 4 points in each round of the competition. This contestant's average (arithmetic mean) score for the entire competition was 3.8 points per round.

Quantity A

9 times the number of rounds in which the contestant scored for 2 points

Quantity B

The number of rounds in which the contestant scored for 4 points

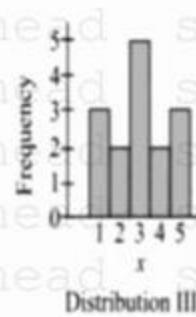
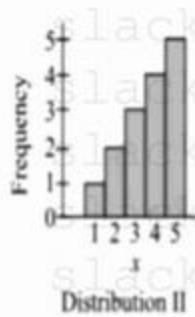
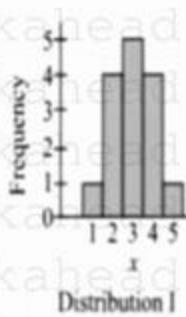
9.

If x , y and z are consecutive positive integers and if $x+y+z$ is even, how many of the four integers xy , yz , zx , and xyz are even?

 None One Two Three Four



10.



In the three frequency distributions, the variable x has integer values from 1 through 5. For which of the distributions is the average (arithmetic mean) of the 15 values of x equal to the median of the 15 values of x ?

O I only

O II only

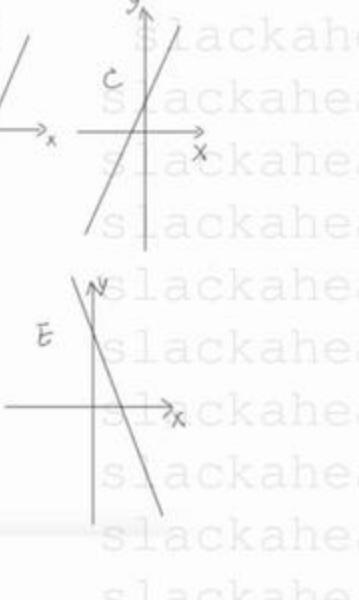
O I and III only

O II and III only

O I, II and III

11.

Which of the following best represents the graph of the equation $y - 5x + 4 = 0$ in the xy -plane?



O A

O C

O D

O E



12.

slackahead

slackahead

slackahead

An artist has 3 hooks on the wall and 5 different pictures. How many different arrangements of 3 pictures can be formed if the artist puts one of the 5 pictures on each hook?

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead 12

slackahead

slackahead

slackahead 15

slackahead

slackahead

slackahead

slackahead 30

slackahead

slackahead

slackahead

slackahead 60

slackahead

slackahead

slackahead

slackahead 125

slackahead

The length of a model car is 8.2 centimeters, and the ratio of the length of the model car to the length of the actual car that it represents is 1 to 64. The length of the actual car is how many meters? (1 centimeter=0.01 meter)

Give your answer to the nearest 0.1 meter.

slackahead

 meters

slackahead

slackahead

slackahead

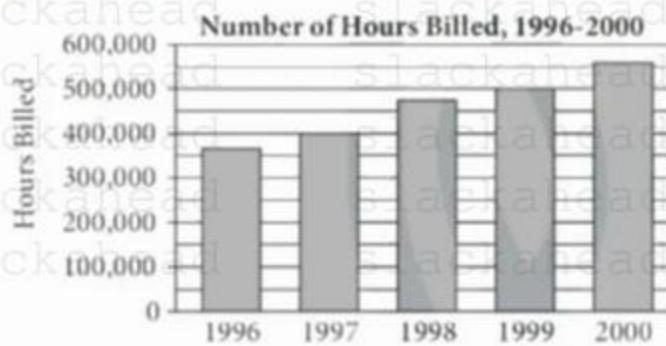
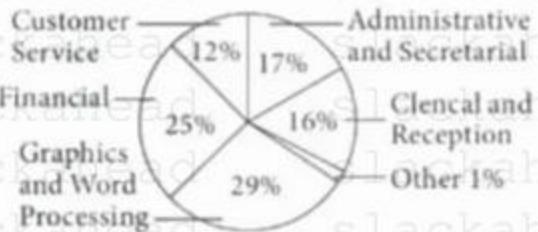
slackahead

slackaheads

slackahead



14.

Hours Billed by Employees of Company X, 1996-2000

Distribution of Hours Billed by Employee Job Category, 2000


For the employees in the customer service job category in 2000, the average billing rate was \$18.50 per hour. Which of the following is the best estimate of the total amount billed by employees in the customer service job category in 2000?

\$12,000,000

\$1,200,000

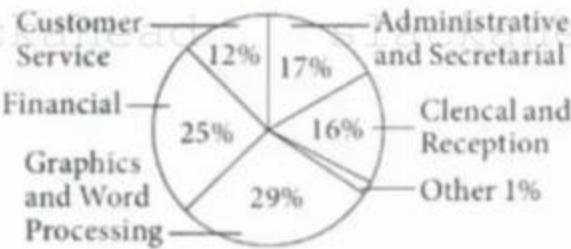
\$120,000

\$12,000

\$1,200

15.

Hours Billed by Employees of Company X, 1996-2000

Distribution of Hours Billed by Employee Job Category, 2000


Which of the following is closest to the ratio of the number of hours billed by employees in 1999 to the number of hours billed by employees in 1996?

2 to 3

3 to 4

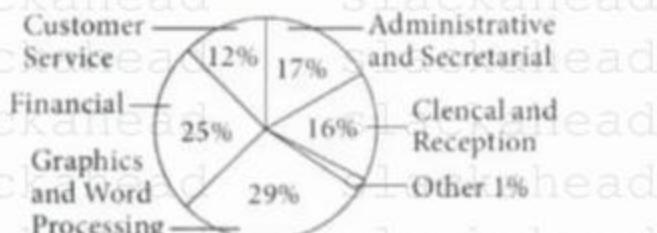
4 to 3

5 to 3

7 to 4



16.

Hours Billed by Employees of Company X, 1996-2000**Distribution of Hours Billed by Employee Job Category, 2000**

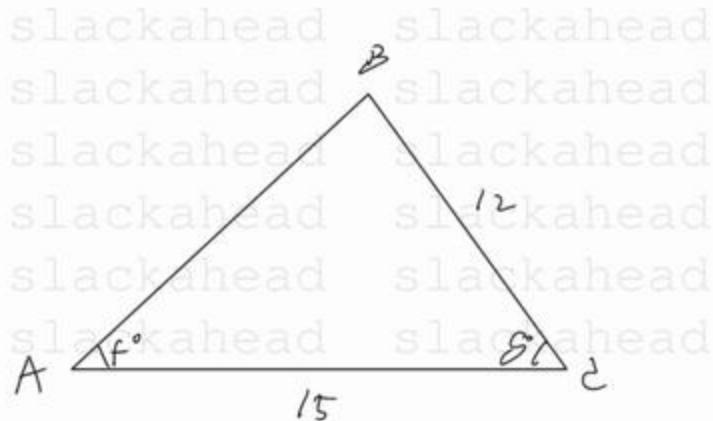
17.

The sum of n numbers is greater than 48. If the average (arithmetic mean) of the n numbers is 1.2, what is the least possible value of n ?





20.



In the figure, $AC=15$ and $BC=12$. If $f+g=90$, then the area of the triangular region is ?

- slackahead ○ 108
slackahead ○ 90
slackahead ○ 81
slackahead ○ 54
slackahead ○ 9

Section 11 Hard

slackahead

1.

slackahead slackahead
slackaheads slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead

Quantity A

The remainder when n is divided by 31

Quantity B

16

2.

Triangular region T has sides of lengths 13, 13 and 10.

Quantity A

Quantity B

65



3.

slackahead

slackahead

slackahead

slackahead

A certain truck takes 10 trips to transport 2,000 cartons from warehouse A to warehouse B. For each trip except the 10th trip, the truck is loaded to its full carrying capacity of x cartons. On the 10th trip, the truck is loaded with the remaining cartons.

Quantity A

$$\underline{x}$$

Quantity B

$$\underline{210}$$

4.

slackahead

slackahead

$$x^{-1}y^{-1}>0$$

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

Quantity A

$$\frac{x^{-1}}{y^{-1}}$$

Quantity B

$$\frac{x}{y}$$

slackahead

5.

slackahead

slackahead

slackahead

slackahead

List K consists of 100 numbers between 20 and 40, and list M consists of 200 numbers between 30 and 50.

Quantity A

The arithmetic mean of the numbers in list K

Quantity B

The arithmetic mean of the numbers in list M

slackahead

slackaheads

slackahead

x and y are positive integers, and $x=10y+2$

Quantity A

The value of the tens digit of x

Quantity B

The value of the units digit of y

slackahead

7.

slackahead

The circumference of a certain circular region is y.

Quantity A

The area of the circular region

Quantity B

$$\frac{y^2}{4}$$



8.

A total of \$48,000 was invested for one month in a new money market account that paid simple annual interest at the rate of r percent.

If the investment earned \$240 in interest for the month, what is the value of r?

- 5.0
- 5.5
- 6.0

- 6.5

- 7.0

9.

The function f is defined by $f(n) = \frac{2n-1}{2n+1}$ for all positive integers n . What is the least positive integer m for which the product $(f(1))(f(2))\dots(f(m))$ is less than or equal to $\frac{1}{15}$?

- 6

- 7

- 8

- 14

- 15

10.

For each of the years 1993 and 1994, the population of City M increased by 20 percent during the year. If the population was 280,000 on December 31, 1994, approximately what was the population on January 1, 1993?

- 235,000

- 210,000

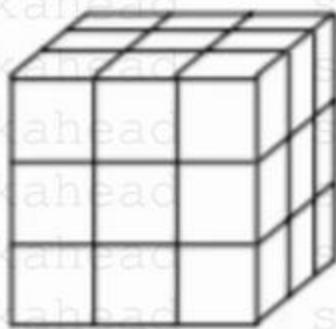
- 195,000

- 180,000

- 165,000



13.



If 20 red cubes and 7 white cubes, all of equal size, are fitted together to form one large cube, as shown above, what is the greatest fraction of the surface area of the large cube that could be red?

 $\frac{8}{9}$ $\frac{47}{54}$ $\frac{23}{27}$ $\frac{5}{6}$ $\frac{20}{27}$

slackahead

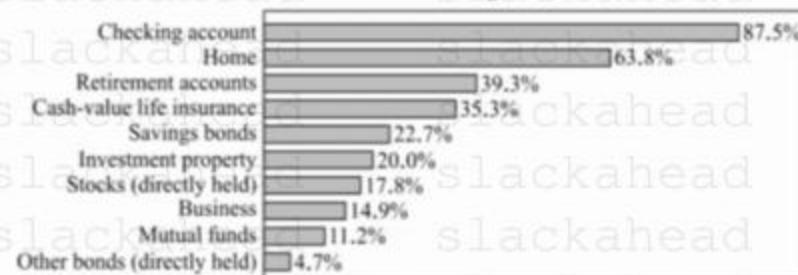
14. slackahead

slackahead

slackaheads slackahead

slackahead

slackahead

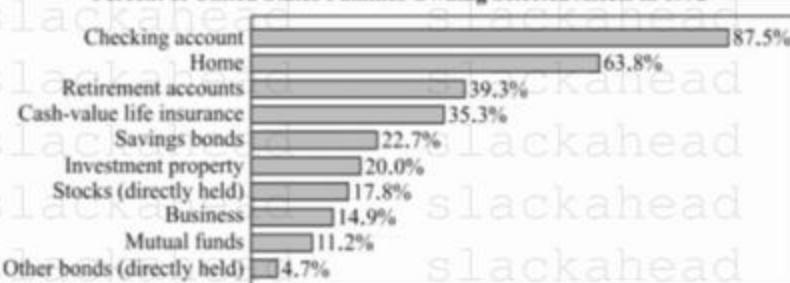
Percent of United States Families Owning Selected Assets in 1992

From 1989 to 1992, there was a 10 percent increase in the percent of families that owned directly held stocks. Which of the following is closest to the percent of families who owned directly held stocks in 1989?

 1.8% 15.0% 15.8% 16.2% 19.6%



15.

Percent of United States Families Owning Selected Assets in 1992

If 38.7 percent of the families who owned a home owed money on a home mortgage loan or home equity loan, or both, approximately what percent of United States families owned homes free of both home mortgage and home equity loans?

- 65%
- 40%
- 30%

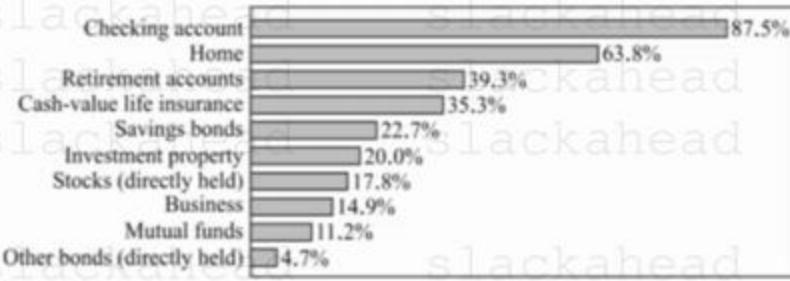
- 25%
- 18%

In 1992, if 7.9 percent of the families in the survey owned both savings bonds and mutual funds, what percent owned neither savings bonds nor mutual funds?

- 41.8%
- 58.2%

- 74.0%
- 78.3%
- 92.1%

16.

Percent of United States Families Owning Selected Assets in 1992

17.

In a certain sequence of numbers, the 1st term is equal to 1 and each term after the 1st term is equal to 12 times the square of the preceding term. If the 5th term of the sequence is equal to 12ⁿ, what is the value of n?



18.

Larry and Tony work for different companies. Larry's salary is the 90th percentile of the salaries in his company, and Tony's salary is the 70th percentile of the salaries in his company.

Which of the following statements individually provide(s) sufficient additional information to conclude that Larry's salary is higher than Tony's salary?

Indicate all such statements.

- The average (arithmetic mean) salary in Larry's company is higher than the average salary in Tony's company
- The median salary in Larry's company is equal to the median salary in Tony's company
- The 80th percentile in Larry's company is higher than the 70th percentile salary in Tony's company

19.

Three numbers are to be selected at random and without replacement from the five numbers 4, 5, 7, 8 and 11. What is the probability that the three numbers selected could be the lengths of the sides of a triangle?

$$\textcircled{O} \frac{1}{5}$$

$$\textcircled{O} \frac{2}{5}$$

$$\textcircled{O} \frac{3}{5}$$

$$\textcircled{O} \frac{4}{5}$$

$$\textcircled{O} 1$$

20.

20 boys and 40 girls are in Group A, while at least 7 boys, together with some girls are in Group B. To choose one person from each of the group, the probability that both are boys is no greater than $\frac{1}{15}$. Which of the following statements must be true?

Indicate all such statements.

- The number of people in group B is greater than 34.
- The number of girls in group B is greater than 32.
- The number of girl in group B is less than 34.



Section 12 Medium

slackahead	slackahead	slackahead	slackahead
1.	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
	Quantity A $(4x)(3(-2x+1))$		Quantity B $(4)(3x)(1-2x)$
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
2.	slackahead	slackahead	slackahead

C_1 and C_2 are two circles in the xy -plane.

The center of circle C_1 is inside circle C_2 .

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
	Quantity A The number of points at which C_1 and C_2 Intersect		Quantity B 1
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
3.	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
	The average (arithmetic mean) of n numbers is 26. One number is discarded, and the average of the remaining numbers is 25.5.		slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
	The discarded number		26
slackahead	slackaheads	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
4.	slackahead	slackahead	slackahead
slackahead	1, 2, 4, 8, 16.....	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
	The first five terms of an infinite sequence are shown above. Each term after the first term is 2 times the preceding term.		slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	n is an odd integer greater than 50.	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
5.	slackahead	slackahead	slackahead
slackahead	$x + \frac{1}{x} = 2$	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

Quantity A

$$x^2 + \frac{1}{x^2}$$

Quantity B

$$x^3 + \frac{1}{x^3}$$



How many different positive three-digit integers are there that have an odd hundreds digit?

- 500

An engineer draws two concentric circles on a blueprint. If the diameter of the outer circle is 6 centimeter greater than the diameter of the inner circle, how much greater, in centimeters, is the circumference of the outer circle than the circumference of the inner circle?

- 6

slackahead $\circ 3\pi$ slackahead
slackahead $\circ 4\pi$ slackahead
slackahead $\circ 6\pi$ slackahead

12.

Set M is composed of all 3-digit positive multiples of 7. What is the range of the numbers in set M?

- 894

- 896



13.

slackahead

slackahead

slackahead

slackahead

If x and y are even integers and $xy = -24$, what is the greatest possible value of $x+y$?

slackahead

14.

PRICE OF WOODEN BOARDS, BY BOARD WIDTH AND TYPE OF WOOD

in dollars per linear foot

Board Width (in inches)	Type of Wood		
	Maple	Oak	Poplar
4	\$1.50	\$1.70	\$1.00
6	\$2.25	\$2.65	\$1.60
8	\$2.90	\$3.20	\$2.20
10	\$3.75	\$4.25	\$2.75
12	\$4.25	\$5.55	\$3.45

Note: All types of boards listed are 1 inch thick.

slackahead

The top surface of a certain 1-inch-thick oak board is 8 inches wide and has an area of 960 square inches. What is the price of this board? (1 foot=12 inches)

 \$26.40 \$29.00 \$32.00 \$34.80 \$40.00

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

15.

PRICE OF WOODEN BOARDS, BY BOARD WIDTH AND TYPE OF WOOD

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	Maple	Oak	Poplar
4	\$1.50	\$1.70	\$1.00
6	\$2.25	\$2.65	\$1.60
8	\$2.90	\$3.20	\$2.20
10	\$3.75	\$4.25	\$2.75
12	\$4.25	\$5.55	\$3.45

Note: All types of boards listed are 1 inch thick.

slackahead

For the 6-inch-wide boards listed, which of the following is closest to the ratio of the price per linear foot of the least expensive type of board to the price per linear foot of the most expensive type of board?

 1 to 2 1 to 3 3 to 4 3 to 5 3 to 6



16.

PRICE OF WOODEN BOARDS, BY BOARD WIDTH AND TYPE OF WOOD
in dollars per linear foot

Board Width (in inches)	Type of Wood		
	Maple	Oak	Poplar
4	\$1.50	\$1.70	\$1.00
6	\$2.25	\$2.65	\$1.60
8	\$2.90	\$3.20	\$2.20
10	\$3.75	\$4.25	\$2.75
12	\$4.25	\$5.55	\$3.45

Note: All types of boards listed are 1 inch thick.

The price of one maple board that is 8 inches wide and n feet long is \$1.50 less than the price of 2 maple boards that are each 4 inches wide and n feet long. What is the value of n ?

- 8
- 10
- 12
- 15
- 20

17.

The sales tax on clothing items in Country A is 25 percent of the purchase price of the item, and the sales tax on clothing items in Country B is 20 percent of the purchase price of the item. If the two countries have the same currency and if the price of a certain clothing item is the same in both countries, what percent greater is the amount of the sales tax on the clothing item purchased in Country A than the amount of sales tax on the clothing item purchased in Country B?

$\frac{\%}{}$

18.

Frequency	Temperature (°F)
3	68
0	69
5	70
2	71
1	72

The daily high temperature, in degrees Fahrenheit, in a certain city were recorded for 11 consecutive days. The table above shows the frequency distribution of the recorded temperatures. Which of the following statements are true?

Indicate all such statements.

- The median and the average (arithmetic mean) of the recorded temperatures are equal
- The median and the mode of the recorded temperatures are equal
- The range of the recorded temperatures is 4 degrees Fahrenheit



Section 13 Hard

1.

Yesterday, 40 percent of the employees who were at work at Company X left for the day before 5 P.M and 70 percent of the remaining employees left for the day before 6 P.M.

Quantity A

The percent of the employees at Company X
yesterday who did not leave for the day before 6 P.M

Quantity B

20%

2.

A list of 6 nonzero numbers has a range of 20. For every number in the list, the negative of the number is also in the list.

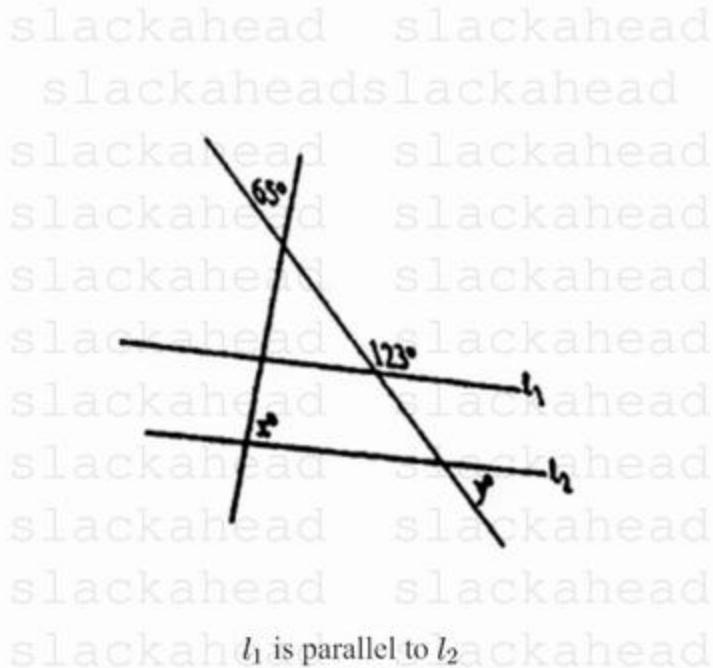
Quantity A

The value of the greatest number in the list

Quantity B

10

3.



Quantity A

x

Quantity B

y



4. slackahead

In the sequence, each term after the first two terms is the absolute value of the difference of the two preceding terms.

slackahead

Quantity A

The first number to occur three times in the sequence

Quantity B

3

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

5. slackahead

Quantity A

The median of the ten measurements in sets X and Y combined

Quantity B

70

slackahead

Quantity A

r

Quantity B

0

slackahead

7. slackahead

slackahead

slackahead

slackahead

Quantity A

$89! - 88! - 87!$

Quantity B

$88^2 * 87!$



8.

In a herd of 90 cows, some are brown, some are white, and the rest are both brown and white. In the herd, 55 cows are entirely or partially white, and 75 cows are entirely or partially brown. If the cows are randomly selected for inoculation, what is the probability that the first cow selected will be entirely white?

slackahead

10.

In the xy-plane, line m passes through the point (7, 7) and is perpendicular to the line $x+y=4$. The point (a, b) is on line m and is halfway between the point (7, 7) and the line $x+y=4$. What is the value of a+b?

slackahead

slackahead</



- During a certain month, 20 percent of all the electricity used by a household was used by the water heater. The cost per kilowatt-hour of the electricity used by the water heater was half the cost per kilowatt-hour of the rest of the electricity used. For that month, the cost of the electricity used by the water heater was what fraction of the cost of the electricity used by the household?

slackahead $\circ \frac{1}{20}$ slackahead
slackahead $\circ \frac{1}{9}$ slackahead

0

slackahead slackahead
slackahead slackahead
slackahead slackahead

○ $\frac{1}{3}$

solution set of the inequality $x^2 + x - 6 < 0$

How many integers

How many integers are in the solution set of the inequality $x^2 + x - 6 < 0$?

○ Three

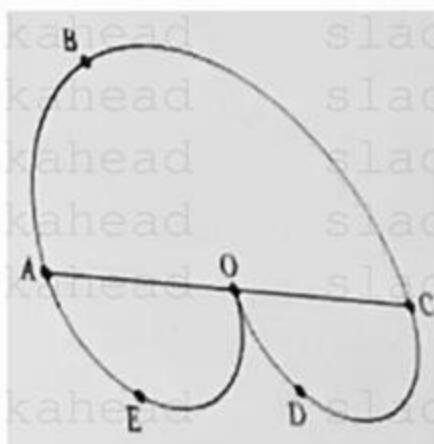
○ Four

Five

5



13.

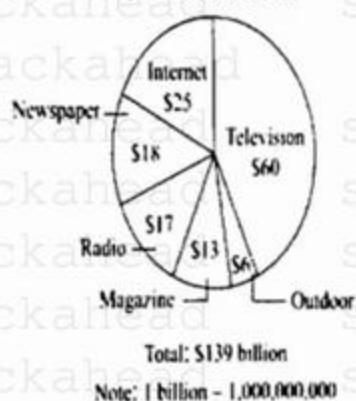


The figure ABCDOE above consists of a large semicircle ABC with center O and two small semicircles AEO and ODC. If the area of figure ABCDOE is 48π , what is the length of diameter AC?

14.

Advertising Expenses in Country X in 2009

Expenses by Media Type
(in billions of dollars)



Distribution of Expenses
for Television, by Market

Market	Percent
National cable	35.3%
Local cable	31.3%
Major network	21.5%
Satellite	7.3%
Syndication	4.6%

To the nearest billion dollars, what was the median of the amounts of advertising expenses in the five television markets?

\$10 billion

\$13 billion

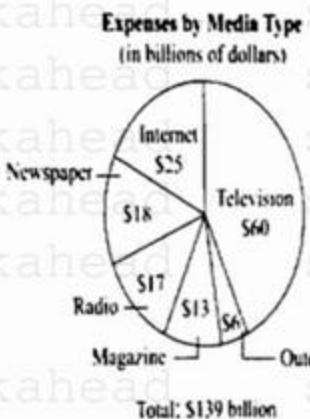
\$17 billion

\$19 billion

\$21 billion



15.

Advertising Expenses in Country X in 2009**Distribution of Expenses for Television, by Market**

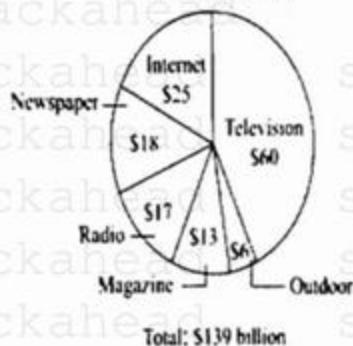
Market	Percent
National cable	35.3%
Local cable	31.3%
Major network	21.5%
Satellite	7.3%
Syndication	4.6%

What was the range of the amounts of advertising expenses in the five television markets?

Give your answer to the nearest billion dollars.

\$ _____ billion

16.

Advertising Expenses in Country X in 2009**Expenses by Media Type**
(in billions of dollars)**Distribution of Expenses for Television, by Market**

Market	Percent
National cable	35.3%
Local cable	31.3%
Major network	21.5%
Satellite	7.3%
Syndication	4.6%

The amount of advertising expenses in the national cable television market was approximately what percent of the total amount of advertising expenses?

10%

15%

24%

35%

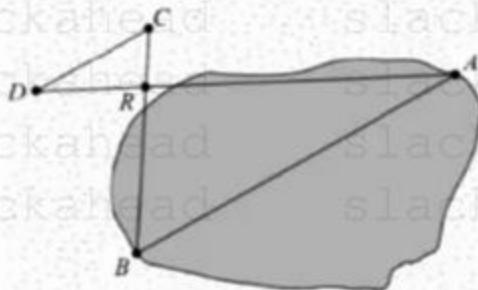
43%



17.

On a construction map of a certain college campus, $\frac{1}{3}$ of the area of the campus is marked by landscaping. Of the part of the campus that is not marked by landscaping, $\frac{1}{8}$ of the area is marked for gym buildings. What fraction of the area of the campus is not marked for either landscaping or gym buildings?

18.



The figure above represents a pond and the nearby land that surrounds it. Lucia plans to measure the distance across the pond from point A to point B. First, she will measure the distance from a rock on land at point R to point D on line AR. Next, she will measure the distance, along a line parallel to line AB, from point D to point C, which lies on line BR. Of the following, which additional measurement will be sufficient to determine the distance from A to B?

The distance from A to R

The distance from B to R

The distance from C to R

The measure of angle ARB

The measure of angle DAB



19.

The operation \bullet is defined by $x \bullet y = \frac{1}{x} + \frac{1}{y}$ for all positive numbers x and y . Which of the following statements must be true for all positive numbers m and r ?

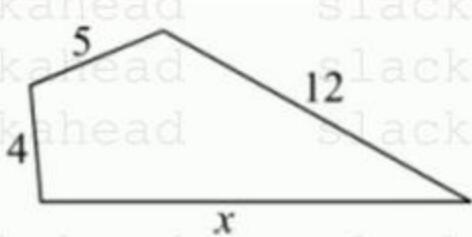
Indicate all such statements.

$\frac{1}{m} \bullet \frac{1}{r} = m+r$

$m \bullet r = \frac{m+r}{mr}$

$m \bullet r = r \bullet m$

20.



For the convex polygon above, which of the following intervals contains all possible value of x ?

$0 < x < 17$

$3 < x < 21$

$4 < x < 12$

$4 < x < 21$

$7 < x < 21$



Section 14 Research

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

 x is a negative integer and $y=2(x-3)$.

slackahead

slackahead

Quantity A y slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

Quantity B

0 slackahead

$$1.25 + y^2 < 2$$

Quantity A y slackahead

slackahead

slackahead

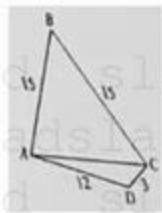
slackahead

Quantity B

0.88 slackahead

Quantity A

The measure of angle BCA



slackahead

slackahead

slackahead

slackahead

Quantity B

45 degrees slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

The original price of a dress was greater than \$60. Maria bought the dress at a sale price that was equal to 80 percent of the original price. The tax Maria paid on the dress was equal to 4 percent of the sale price.

Quantity A

The dollar amount of the tax Maria paid on the dress

Quantity B

3% of the original price of the dress



12. slackahead

slackahead slackahead

slackahead

According to a certain model, if the purchase price of a car is p dollars and the annual rate of depreciation is r percent, compounded annually, then the value v of the car, in dollars, n years after it was purchased is given by the formula $v = p(1 - \frac{r}{100})^n$. If the value of a car 4 years after it was purchased is $\frac{3}{4}$ of the purchase price, approximately what is the annual rate of depreciation?

slackahead slackahead

slackahead

slackahead slackahead

slackahead

slackahead 7%

slackahead

11%

slackahead

slackahead 14%

slackahead

slackahead

slackahead 20%

slackahead

slackahead

slackahead 25%

slackahead

Regular hexagon H and regular octagon K have equal perimeters. If the length of a side of H exceeds the length of a side of K by 24, what is the length of a side of K?

slackahead

slackahead slackahead

slackahead

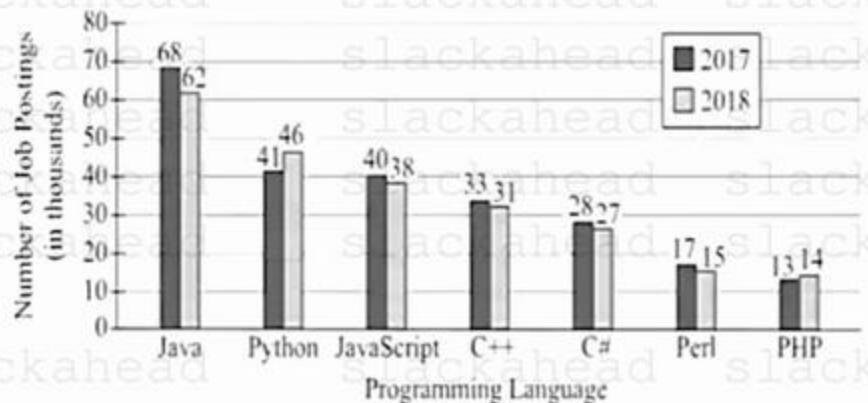
slackahead



14.

Job Postings in Country X for Seven Computer Programming Languages.

2017 and 2018



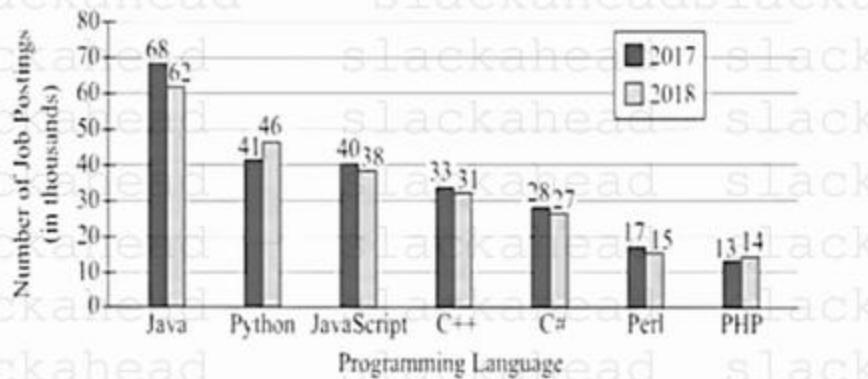
In 2017, for how many of the programming languages was the number of job postings between $\frac{1}{9}$ and $\frac{1}{3}$ of the total number of job postings for the programming languages shown?

- One
- Two
- Three
- Four
- Five

15.

Job Postings in Country X for Seven Computer Programming Languages.

2017 and 2018



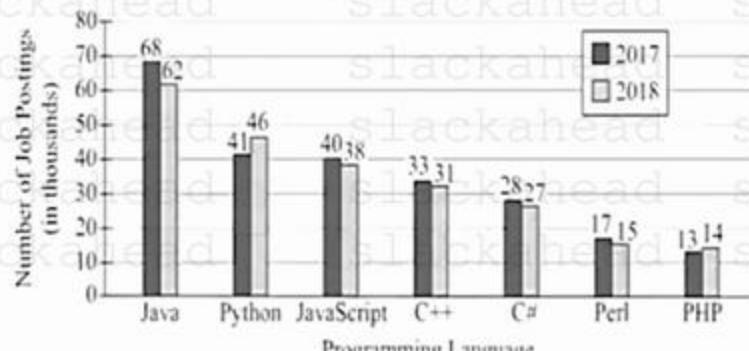
Which of the following is the best estimate of the greatest percent decrease from 2017 to 2018 in the number of job postings for the programming languages shown?

- 2%
- 12%
- 22%
- 32%
- 42%



16.

Job Postings in Country X for Seven Computer Programming Languages
2017 and 2018



Based on the information given, which of the following statements are true? Indicate all such statements.

- A. In 2018, the total number of job postings for programming languages with between 20,000 and 40,000 job postings was more than 40 percent of the total number of job postings for the programming languages shown.
- B. In 2018, the total number of job postings for programming languages with fewer than 20,000 or more than 40,000 job postings was less than 60 percent of the total number of job postings for the programming languages shown.
- C. In Country X, if the number of job postings for PHP was 12,000 in 2016, then the percent increase in the number of job postings for PHP from 2016 to 2017 was equal to the corresponding percent increase from 2017 to 2018.

17.

Data set P consists of 32 numbers, including the number 15.2. The sum of the numbers in P is 400. If 15.2 is 0.5 standard deviation above the mean of the numbers in P, which of the following could be a number in P that is 1.5 standard deviations below the mean of the numbers in P?

3.0

4.4

5.9

6.4

8.1



18.

Data set P consists of 32 numbers, including the number 15.2. The sum of the numbers in P is 400. If 15.2 is 0.5 standard deviation above the mean of the numbers in P, which of the following could be a number in P that is 1.5 standard deviations below the mean of the numbers in P?

3.0

4.4

5.9

6.4

8.1

19.

If $-2 < a < -1 < b < 0 < c < 1$, which of the following statements about the products ab, ac and bc must be true?

ab < ac < bc

ab < bc < ac

ac < ab < bc

ac < bc < ab

bc < ac < ab

20.

A sailmaker made two flat sails, S and T, each in the shape of a trapezoid with a pair of parallel horizontal bases. The bottom bases of the sails have the same length x, where x is 3 times the length of the top base of sail S, and x is 2 times the length of the top base of sail T. The height of sail T is 1.5 times the height of sail S. Both sails were made of material that had a fixed cost per unit area. If the total cost of the material for sail S was \$400, what was the total cost of the material for sail T?

\$400

\$450

\$600

\$675

\$900



Section 15 Medium

slackahead

slackahead

1.

On the number line, points R, S, and T have coordinates r, s, and t, respectively, where $r=2t$. Point R is to the right of point S, and point T is to the left of point R.

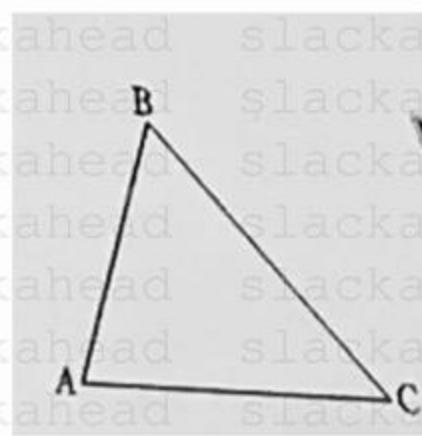
Quantity A

t

Quantity B

s

slackahead



In triangle ABC shown, $AB=BC$ and the measure of angle BAC is 58 degrees.

slackahead

Quantity A

AC

Quantity B

AB

slackahead

Quantity A $\frac{a}{a-1}$ **Quantity B** $\frac{a+1}{a}$

slackahead

slackahead

slackahead

slackahead

$$r = \frac{a}{a+b+c}, s = \frac{b}{a+b+c}, \text{ and } t = \frac{c}{a+b+c}.$$

Quantity A

The average (arithmetic mean) of r, s and t

Quantity B $\frac{1}{3}$



5.

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

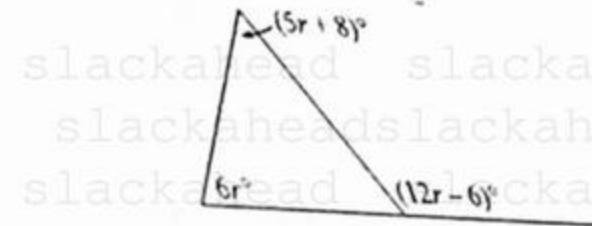
slackahead slackahead
slackahead slackahead
 $x \text{ and } y \text{ are integers}$
slackahead slackahead
 $9^{6x} = 81^{3y}$
slackahead slackahead
Quantity A slackahead
 x slackahead
slackahead slackahead

slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead

6.

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
7.

slackahead slackahead slackahead slackahead
In a quality control study, 200 boxes of brackets were examined; each box contained 50 brackets. For each box, the ratio, f , of the number of defective brackets in the box to the total number of brackets in the box was recorded. The number of defectives per box varied from 1 to 12, inclusive.
Quantity A slackahead
The sum of the 200 values of f slackahead
Quantity B slackahead
The sum of the squares of the 200 values of f slackahead
slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead



Quantity A slackahead
 r slackahead
Quantity B slackahead
12 slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead
8. slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead
 $T_1, T_2, T_3, \dots, T_k, \dots$

The sequence shown is defined by $T_1 = 2$ and $T_{k+1} = \frac{1}{3}T_k$ for each positive integer k .

Quantity A

T_5

Quantity B

$(3^{11})T_{16}$



- Bob's current salary is 10 percent greater than Sam's current salary. Bob and Sam will each receive an increase to their respective salaries at the end of the year, and after the increases in their salaries will be equal. If Bob's increase will equal 5 percent of his current salary, then Sam's increase will be what percent of Sam's current salary?

- | Variant | Percentage |
|------------|------------|
| slackahead | 10.5% |
| slackahead | 12.5% |
| slackahead | 15.5% |
| slackahead | 15.5% |

10.

If $(a+b)^2 - 6(a+b) + 9 = 0$, what is the value of $a+b$?

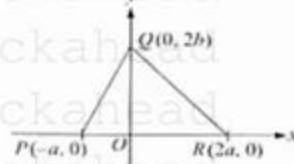
- 15.5%

- 18.5%

- © 2015



11.



Which of the following gives the area of triangular region PQR in the figure above?

The area of triangular region PQR in the figure above?

slackahead $\bigcirc \frac{3ab}{2}$ slackahead
slackahead $\bigcirc 2ab$ slackahead
slackahead $\bigcirc 3ab$ slackahead
slackahead $\bigcirc 4ab$ slackahead
slackahead $\bigcirc 6ab$ slackahead

12.

Value of x	Frequency
15	4
16	15
17	10
18	8
19	6
20	2
21	2

For the frequency distribution of the variable x shown in the table above, what is the median value of x ?

slackahead ○¹⁶ slackahead
slackahead ○^{16.5} slackahead
slackahead ○¹⁷ slackahead

○17.5

○ 18



13.

$$\frac{5+5}{x} = 5$$

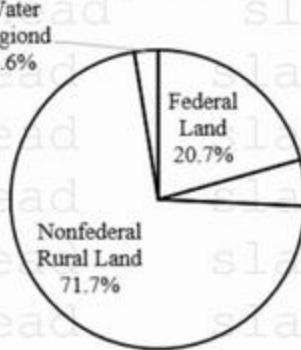
In the equation above, what is the value of x ?

$x = \underline{\hspace{2cm}}$

14.

Area of Federal and Nonfederal Land and Water Region in the Contiguous United States, 1997

Area of the Contiguous United States, 1997



Total Area of the contiguous United States:

3,027,699 square miles

Area of Selected States (in square miles)

State	Federal Land	Nonfederal Developed Land	Nonfederal Rural Land	Water Region	Total Area
California	75,913	8,886	66,216	7,595	158,610
Maryland	2,863	2,017	6,848	569	12,297
Missouri	4,322	4,145	57,614	3,628	69,709
New Jersey	1,061	2,889	3,606	594	8,150
Vermont	1,030	541	7,908	138	9,617
Wyoming	45,600	1,119	49,214	1,884	97,817

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

Approximately what was the ratio of the area of the non federal rural land in Maryland to the total area of the nonfederal rural land in the contiguous United States in 1997?

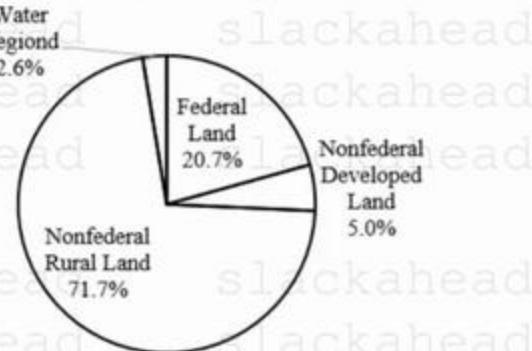
- $\frac{1}{3}$
- $\frac{1}{30}$
- $\frac{1}{300}$
- $\frac{1}{3,000}$
- $\frac{1}{30,000}$



15.

Area of Federal and Nonfederal Land and Water Region in the Contiguous United States, 1997

Area of the Contiguous United States, 1997



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3,027,699 square miles

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Vermont	1,030	541	7,908	138	9,617
Wyoming	45,600	1,119	49,214	1,884	97,817

Of the six states listed in the table, how many contained more than 2 percent of the nonfederal development land in the contiguous United States in 1997?

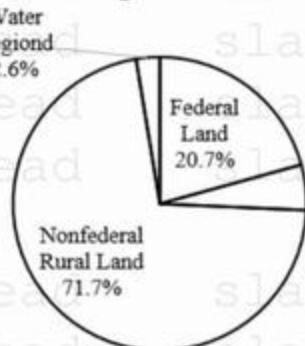
- None
- One
- Two
- Three
- More than three



16.

Area of Federal and Nonfederal Land and Water Region in the Contiguous United States, 1997

Area of the Contiguous United States, 1997



Total Area of the contiguous United States:

3,027,699 square miles

Area of Selected States (in square miles)

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Missouri	4,322	4,145	57,614	3,628	69,709
New Jersey	1,061	2,889	3,606	594	8,150
Vermont	1,030	541	7,908	138	9,617
Wyoming	45,600	1,119	49,214	1,884	97,817

Which of the following is closest to the percent of federal land in the contiguous United States that was part of California in 1997?

3%

4%

6%

9%

12%

17.

The sales tax on clothing items in Country A is 25 percent of the purchase price of the item, and the sales tax on clothing items in Country B is 20 percent of the purchase price of the item. If the two countries have the same currency and if the price of a certain clothing item is the same in both countries, what percent greater is the amount of sales tax on the clothing item purchased in Country A than the amount of sales tax on the clothing item purchased in Country B?

 %



18. slackahead

A certain box is in the shape of a cube. If the total surface area of the box is 384 square feet, what is the total length, in feet, of all the edges of the box?

slackahead

48

64

72

80

96

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

19.

The probability that event R will occur is 0.35, and the probability that events R and T will both occur is p. What is the least possible value of p?

slackahead

slackaheads

slackahead

0.00

0.35

0.50

0.65

0.70

1.00



2.

Q is a set of 36 different numbers with the property that if p is in Q, then -p is also in Q. The number 25 is in Q.

Quantity A

The range of the numbers in Q

Quantity B

40

3.

The circumference of circle C is equal to the perimeter of square S.

Quantity A

The ratio of the area enclosed by C to the area

enclosed by S

Quantity B

1

4.

Dr. Bradley treated a different number of patients on each of the 5 working days last week, and the least number of patients treated on any of the days was 20. No patient was treated on more than one day.

Quantity A

The least possible total number of patients that Dr.

Bradley treated on the 5 working days last week

Quantity B

110

5.

In the xy-plane, S is the set of all points (c, d) for which c and d are both integers.

Quantity A

The number of points in S that are a distance of 2 units from the point $(7, 5)$

Quantity B

4

6.

$$x^2=4 \text{ and } y^2=1$$

Quantity A

$$(x - y)^2$$

Quantity B

3



7.

- slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

Quantity A

$$a+b$$

a and b are integers, and $a^2+b^2=100$.

Quantity B

$$10$$

8.

A certain baker sent 280 loaves of bread to a grocery store. The baker packed the loaves in two types of boxes. The smaller type of box could hold up to 8 loaves, while the larger type of box could hold up to 12 loaves. When the baker sent the loaves, all the boxes were full and there were equal numbers of both types of boxes. What fraction of the loaves of bread sent to the grocery store were packed in the smaller boxes?

- slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

- $\frac{1}{3}$
 $\frac{2}{5}$
 $\frac{1}{2}$
 $\frac{3}{5}$
 $\frac{2}{3}$

- slackahead
slackahead
slackahead

9.

The electric power P in a resistor is directly proportional to the square of the electric current I flowing through the resistor. For a given resistor, if the power is 18 watts when the current is 3 amperes, what is the power, in watts, when the current is 4 amperes?

- slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

- 24
 30
 32
 36
 64



10.

In a certain sequence, each term after the first is equal to the preceding term multiplied by $-\frac{1}{2}$. If the 200th term is positive, which of the following statements must be true?

Indicate all such statements.

 The 10th term is positive The sum of any 2 consecutive terms is positive The product of any 3 consecutive terms is positive

11.

What's the remainder when 3^{82} is divided by 5?

 0 1 2 3 4

12.

The retail price of each item in a certain store consists of the cost of the item, a profit that is 10 percent of the cost, and an overhead that is 30 percent of the cost. If an item in the store has a retail price of \$21, what is the cost of the item?

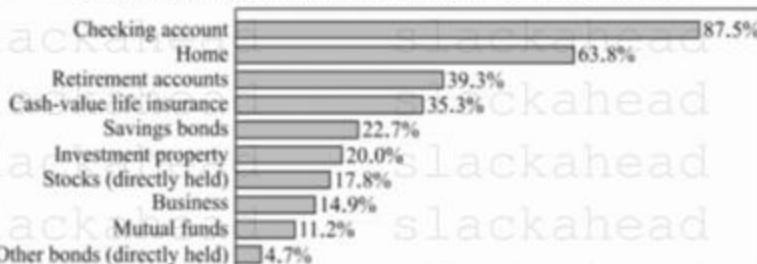
13.

The retail price of each item in a certain store consists of the cost of the item, a profit that is 10 percent of the cost, and an overhead that is 30 percent of the cost. If an item in the store has a retail price of \$21, what is the cost of the item?



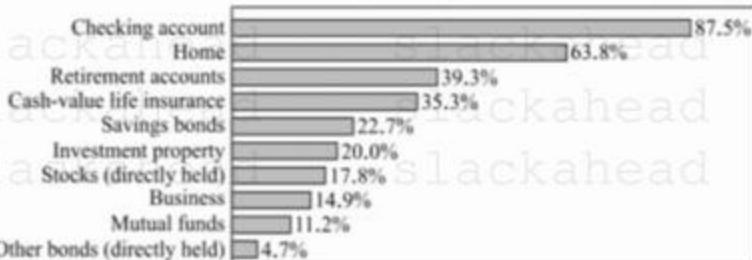
14

Percent of United States Families Owning Selected Assets in 1992



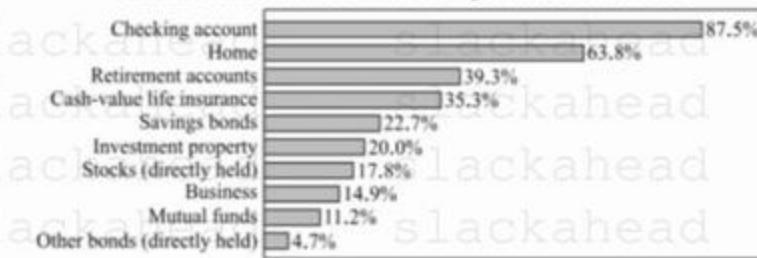
15.

Percent of United States Families Owning Selected Assets in 1992



16.

Percent of United States Families Owning Selected Assets in 1992



From 1989 to 1992, there was a 10 percent increase in the percent of families that owned directly held stocks. Which of the following is closest to the percent of families who owned directly held stocks in 1989?

- 1.8%
 - 15.0%
 - 15.8%
 - 16.2%
 - 19.6%

If 38.7 percent of the families who owned a home owed money on a home mortgage loan or home equity loan, or both, approximately what percent of United States families owned homes free of both home mortgage and home equity loans?

- 65%
 40%
 30%
 25%
 18%

In 1992, savings bonds were the most popular investment for children under age 18.

41.8%
 58.2%
 74.0%
 78.3%
 92.1%

In 1992, if 7.9 percent of the families in the survey owned both savings bonds and mutual funds, what percent owned neither savings bonds nor mutual funds?



17.

In the xy -plane, the point $(3p, 5p-1)$ lies on the line with equation $y = -\frac{1}{2}x - \frac{5}{3}$. What is the value of p ?

Give your answer as a fraction.

18.

A committee of 4 people consisting of 2 men and 2 women is to be selected from 5 sets of fraternal twins, where each set consists of one man and one woman. If only 1 person from each set of twins may be selected for the committee, what is the total number of distinct committees that can be formed?

- 5
- 10
- 20
- 30
- 40

slackahead

slackahead

19.

Which of the following is an odd integer?

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



20.

A hexagon with sides of equal length and interior angles of equal measure is inscribed in a circle. If the perimeter of the hexagon is 12, what is the perimeter of an equilateral triangle inscribed in the same circle?

$$\circ 6$$

$$\circ 9$$

$$\circ 2\sqrt{3}$$

$$\circ 3\sqrt{3}$$

$$\circ 6\sqrt{3}$$

Section 17 Research

1.

$$8x+24=56$$

slackahead

slackahead

Quantity A

$$2x+6$$

slackaheads slackahead

Quantity B

$$15$$

slackahead

slackahead

2.

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

 x is a positive integer.Quantity A

$$5^{-x}$$

slackaheads slackahead

Quantity B

$$1$$

slackaheads slackahead

slackaheads slackahead



3.

slackahead

slackahead

slackahead

slackahead

The list price of a belt and the list price of a scarf were each reduced by \$5. The percent decrease in the list price of the belt was less than the percent decrease in the list price of the scarf.

Quantity A

The list price of the belt

Quantity B

The list price of the scarf

4.

slackahead

Quantity A

x

Quantity B

y

5.

slackahead

List T consists of 6 different numbers, and the average (arithmetic mean) of the numbers in T is less than the median of the numbers in T.

T. The average of the 4 least numbers in T is 6, and the average of the 4 greatest numbers in T is 13.

Quantity A

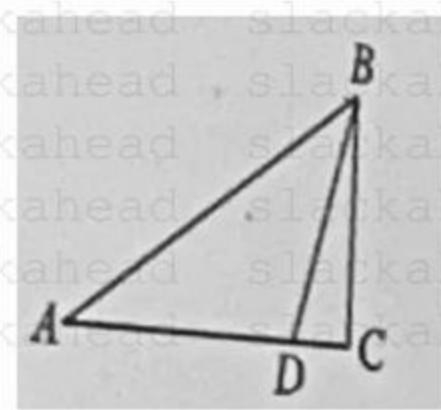
The median of the 6 numbers in T

Quantity B

9.5



7



Quantity A

The ratio of the area of triangle ABD to the area of the triangle ABC

AD=4(DC)

Quantity_B

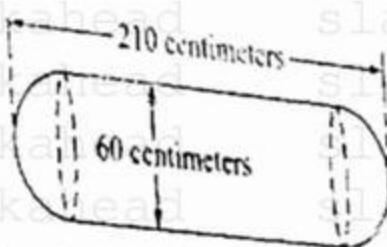
23

8

The cost to rent a motorbike from a rental shop is x dollars per hour for the first 3 hours and y dollars for each hour thereafter. Which of the following represents the total cost, in dollars, of renting a motorbike from this shop for an 8-hour period?



11.



The figure above shows the interior of a propane tank in the shape of a right circular cylinder with a hemisphere at each end. The diameter of the cylinder is 60 centimeters, and the total length of the interior of the tank is 210 centimeters. The tank is filled with propane to 80 percent of its capacity. If the cost of the propane is \$0.60 per liter, approximately what is the cost of the propane in the tank?

(Note: 1 liter = 1,000 cubic centimeters. The volume of a sphere of radius r is $\frac{4}{3}\pi r^3$.)

\$204

\$258

\$285

\$322

\$339

12.

$$n=12!$$

Which of the following is a factor of n ?

143

250

729

2,048

3,072

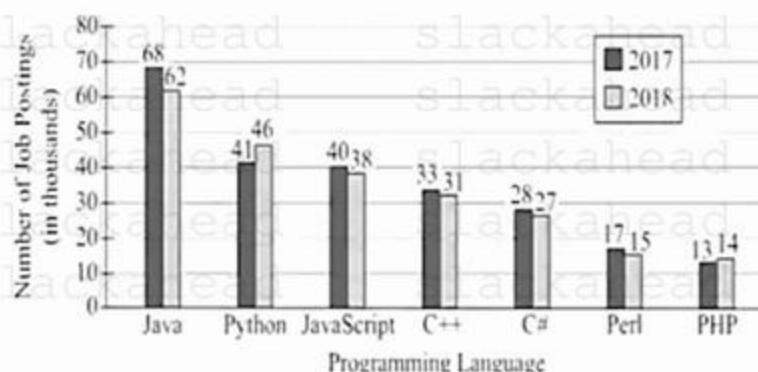


13.

A storage facility rents units of two sizes, small and large. Each small unit has a capacity of 800 cubic feet and a monthly rental fee of \$95. Each large unit has a capacity of 2,000 cubic feet and a monthly rental fee of \$200. The total of the capacities of all the units is 98,400 cubic feet. For a month in which all the units are rented, the total of the monthly rental fees for all the units is \$10,560. What is the total number of units that the storage facility has?

14.

Job Postings in Country X for Seven Computer Programming Languages, 2017 and 2018



For the programming languages shown, the ratio of the greatest number of job postings in 2018 to the least number of job postings in 2018 was closest to which of the following?

4 to 1

22 to 5

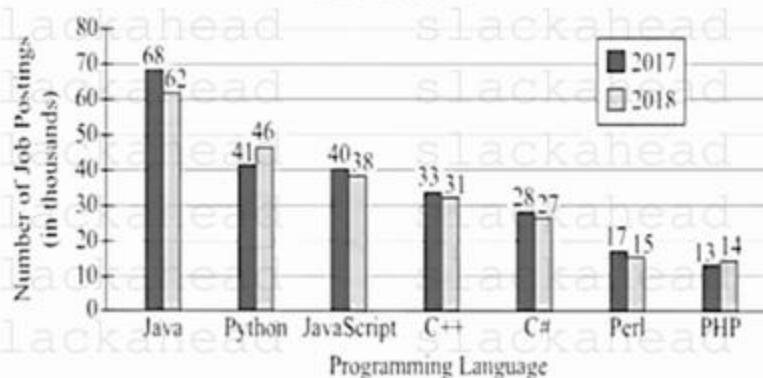
9 to 2

5 to 1

31 to 5

15.

Job Postings in Country X for Seven Computer Programming Languages, 2017 and 2018



For 2017, let M be the median number of job postings for the programming languages shown and let P be the median number of job postings for the programming languages shown except for PHP. What is the value of P-M?

3,500

5,000

7,000

7,500

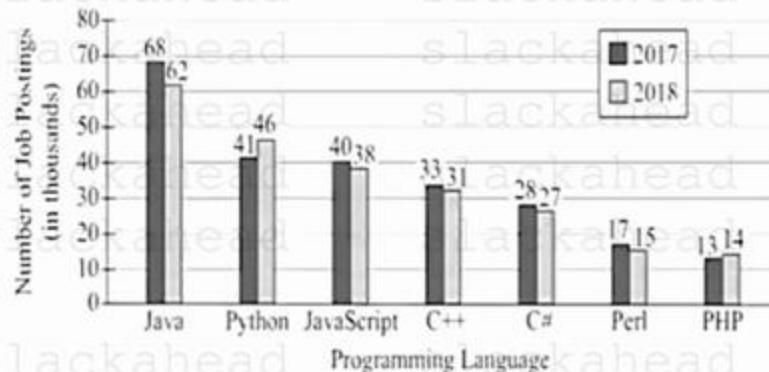
8,000



16.

Job Postings in Country X for Seven Computer Programming Languages.

2017 and 2018



slackahead slackahead slackahead slackahead slackahead slackahead slackahead

If the numbers of job postings for each language and year except Java in 2018 were as shown, and if the range of the numbers of job postings for 2018 had been equal to that for 2017 instead of what it actually was, what would have been the number of job postings for Java in 2018?

thousand

17.

Points A, B, and C are on a circle, and line segment AC is a diameter of the circle. If the radius of the circle is 6, by how much does the length of arc ABC exceed the length of diameter AC?

Give your answer to the nearest integer.

18.

Each time a certain coin is tossed, it lands either heads up or tails up. The coin has the property that the probability that it will land heads up when tossed 1 time is 0.6. If the coin is to be tossed 3 times, what is the probability that it will land heads up at least 2 times?

$\frac{18}{125}$

$\frac{27}{125}$

$\frac{54}{125}$

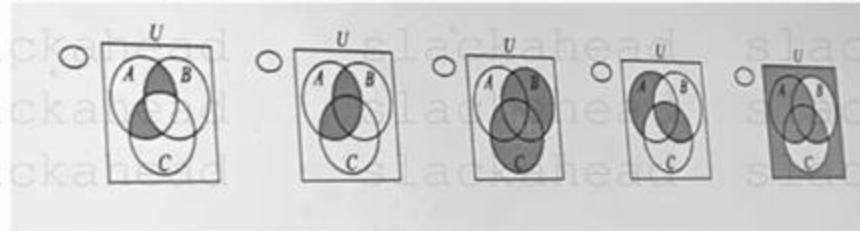
$\frac{75}{125}$

$\frac{81}{125}$



19.

Set A, B, and C are subsets of a universal set U, as represented by the circular regions in the following diagrams. The set \overline{B} consists of the elements in U that are not in B, and the set \overline{C} consists of the elements in U that are not in C. The set $A \cap ((B \cap \overline{C}) \cup (C \cap \overline{B}))$ is represented by the shaded regions in which of the following diagrams?



20.

Let S be the sequence of consecutive odd integers from 1 to 99. Sequence T is obtained from S by removing the integer 3 and then removing every 3rd integer after 3. Sequence V is obtained from T by removing the integer 7 and then removing every 7th integer after 7. Which of the following integers is in V?

7. Which of the following integers is in V?



Section 18 Medium

slackahead	slackahead	slackahead	slackahead
1.	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	Quantity A $\sqrt{a^2 + b^2}$	slackahead	Quantity B $\sqrt{a^2 + \sqrt{b^2}}$

slackahead	slackahead	slackahead	slackahead
2.	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	Quantity A $\frac{(5!+6!)}{(6!+7!)}$	slackahead	Quantity B $\frac{1}{6}$
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
3.	slackahead	slackahead	slackahead

The speed of light is 3×10^8 meters per second, rounded to the nearest 10^8 meters per second. A "light-hour" is the distance that light travels in an hour.

slackahead	slackahead	slackahead	slackahead
slackahead	Quantity A The number of kilometers in a light-hour	slackahead	Quantity B 10^{10}
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
4.	slackahead	slackahead	slackahead
slackahead	slackahead	$y+5 > x$	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	Quantity A $y+2$	slackahead	Quantity B $x-2$
slackahead	slackahead	slackahead	slackahead



9.

A certain machine devotes 45 seconds every 3 hours to a system check, and the machine is in operation 24 hours a day. At this rate, how many days of production will it take for the machine to spend a total of 3 hours on systems checks?

- ⚡ 5
 ⚡ 8
 ⚡ 15
 ⚡ 30
 ⚡ 40

10.

Week	1	2	3	4	5
Revenue	\$850	\$1,200	\$1,100	\$900	\$950
Expenses	\$600	\$650	\$950	\$800	\$650

The table above shows a certain store's weekly revenue and expenses for five weeks. What is the store's median weekly profit for the five weeks?

- ⚡ \$150
 ⚡ \$200
 ⚡ \$250
 ⚡ \$270
 ⚡ \$300



11.

slackahead

In the decimal number 1,375.2648, which digit has a place value that is 1,000 times the place value of the digit 6?

slackahead

 O 1 slackahead

slackahead

slackahead

slackahead

 O 3 slackahead

slackahead

slackahead

slackahead

 O 4 slackahead

slackahead

slackahead

slackahead

 O 5

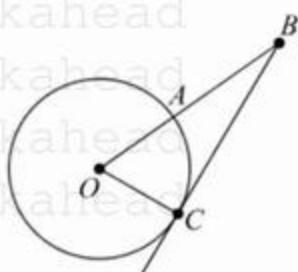
slackahead

slackahead

slackahead

 O 7 slackahead

In the figure above, BC is tangent to the circle with center O and radius 6. If BA=4, what is the area of the triangular region BCO?



slackahead

 O 24 O 36 O 40 O 48 O It cannot be determined from the information given.



13.

On May 5, 2004, the closing price of Stock A was \$60.00, which was a decrease of 8 percent from the closing price of the stock on the previous day, May 4, 2004. On May 6, 2004, the closing price of the stock was exactly the same as the closing price on May 4, 2004. What was the percent increase in the closing price of the stock from May 5, 2004 to May 6, 2004?

Give your answer to the nearest whole percent.

_____ %

14.

Number of Motor Vehicles Owned by a Random Sample of 900 Families

Number of Motor Vehicles Owned	Number of Families
At least 1	900
At least 2	610
At least 3	250
More than 3	75

15.

Number of Motor Vehicles Owned by a Random Sample of 900 Families

Number of Motor Vehicles Owned	Number of Families
At least 1	900
At least 2	610
At least 3	250
More than 3	75

slackahead
slackahead
slackahead

Approximately what percent of the families in the sample own more than 3 motor vehicles?

- 2.8%
- 3.5%
- 4.2%
- 8.3%
- 27.5%

How many of the families own exactly 2 motor vehicles?

- 610
- 360
- 285
- 250
- 175



16.

Number of Motor Vehicles Owned by a Random Sample of 900 Families

Number of Motor Vehicles Owned	Number of Families
At least 1	900
At least 2	610
At least 3	250
More than 3	75

17.

If $3^x + 3^x + 3^x = 9^{x-2}$, what is the value of x?

18.

Each digit of a 20-digit number is either a 1, 2, 3, 4, or 5. If the average (arithmetic mean) of 15 of the 20 digits of the number is 2.8 and if M is the average of all 20 digits of the number, then M must satisfy which of the following inequalities?

A $1.95 \leq M \leq 2.25$

B $2.15 \leq M \leq 2.50$

C $2.25 \leq M \leq 2.55$

D $2.35 \leq M \leq 3.35$

E $2.45 \leq M \leq 3.55$



19.

Minutes	Number of Students
0 to 19	10
20 to 39	21
40 to 59	9
60 to 79	3
80 to 99	3

The frequency distribution above summarizes the numbers of minutes, rounded to the nearest integer, that 46 students individually spent studying for an exam. Based on the information given, which of the following statements must be true?

Indicate all such statements.

The total number of minutes that all of the students spent studying is greater than 1,500.

The average (arithmetic mean) number of minutes spent studying per student is greater than 25.

The range of the numbers of minutes spent studying is greater than 60.

20. The operation \square is defined by $r \square s = 12 r^{-1}(s+3)$ for all positive numbers r and s . If $x \square 3 = 18$, what is the value of x ?

$0\frac{1}{4}$

$0\frac{1}{2}$

$0\frac{3}{2}$

0^2

0^4



Section 19 Hard

slackahead

slackahead

slackahead

slackahead

slackahead

Quantity A

The percent increase in the value of y when the value of x is increased by 10%

$$y=2x+1, \text{ where } x > 0.$$

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

Quantity A

$$X - Y$$

X is the sum of all the even positive integers less than or equal to 50.

Y is the sum of all the odd positive integers less than or equal to 49.

slackahead

Quantity A

The total number of vases machine A produces

slackahead

Quantity A

$$r$$

$$|3r+2|=r+6$$

Quantity B

$$0$$

slackahead



5.

6.

In the figure, point A is the center of the circle and points B and D lie on the circle. The length of \overline{DC} is one-half of the length of \overline{AD} .

Quantity A

The area of sector ABD

Quantity B

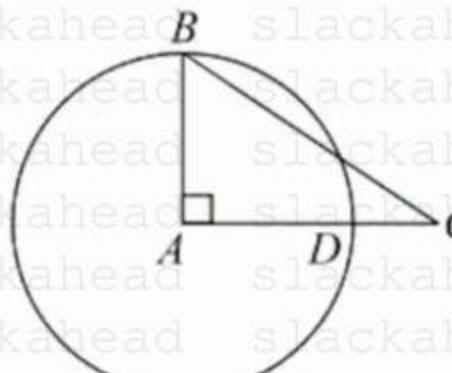
The area of triangle ABC

Quantity A

xi

Quantity B

10



Quantity A

$$x^2 + y^2$$

Quantity B

4r²



8.

One day in 1997 at a gas station in the United States near the border of Canada, gasoline was selling for \$1.20 per gallon (United States dollars). On that day, 1 United States dollar could be exchanged for 1.25 Canadian dollars. If gasoline was being sold at an equivalent rate at a gas station across the border in Canada, which of the following calculations gives an approximate price, in Canadian dollars, for a liter of gasoline at the Canadian gas station that day? (1 gallon is approximately 3.785 liters.)

A $\frac{(1.20)(3.785)}{1.25}$
 B $\frac{(1.20)(1.25)}{3.785}$

C $(1.20)(3.785)(1.25)$
 D $\frac{(1.20)}{(1.25)(3.785)}$
 E $\frac{3.785}{(1.20)(1.25)}$

9.

At Least Mushrooms	At Least Onions	At Least Peppers	Mushrooms and Onions	Mushrooms and Peppers	Onions and Peppers
80	100	90	28	23	25

A restaurant made 200 pizzas, some of which has no toppings, while the others had at least one of three toppings-mushrooms, onions, and peppers-as summarized in the table above. No pizza had all three toppings. How many of the pizzas had no toppings?

A 6

B 8

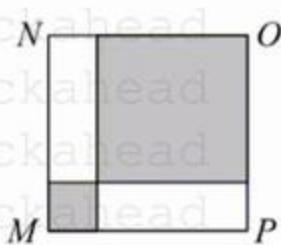
C 10

D 11

E 12



10.



A 2x2 matrix diagram with labels N, M, O, and P. The top-left cell is white and labeled N. The top-right cell is gray and labeled O. The bottom-left cell is gray and labeled M. The bottom-right cell is white and labeled P.

In square MNOP shown, the two shaded square regions have areas in the ratio 9 to 1. If square region MNOP has area 144, what is the area of each of the two unshaded rectangular regions?



11.

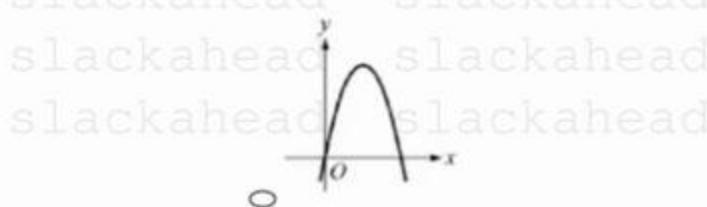
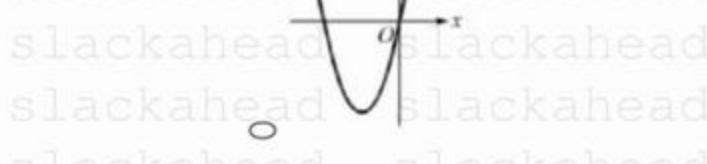
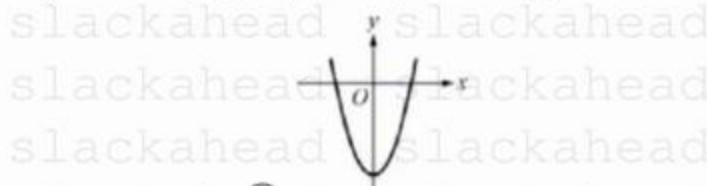
Which of the following is true?

12. k, m , and n are integers.

If k and m are negative integers, which of the following must be negative integers?

Indicate all such integers.

Is a portion of the graph of $y = (x + 2)^2 - 5$ in the xy -plane?



slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead
 $m - p^2$
slackahead slackahead
slackahead slackahead
 $(k-1)(p+1)$
slackahead slackahead



13.

If k and n are each positive integers between 12 and 30, then $\frac{5+k}{7+n}$ will be equal to $\frac{5}{7}$ for how many pairs of (k, n) ?

 Two Three Four Seventeen Nineteen

For those industries that experienced a decrease in the value of mergers and acquisitions from the first quarter of 2001 to the first quarter of 2002, what was the range of the values of mergers and acquisitions in the first quarter of 2002?

 \$1.4 billion \$7.3 billion \$7.6 billion \$7.7 billion \$10.0 billion**Value of Mergers and Acquisitions for Selected Industries****in the United States, First Quarter 2002**

Industry	First Quarter 2002 Value (in billions*)	Percent Change from First Quarter 2001
Chemical	\$2.8	-4%
Health care	\$4.6	-74%
Media	\$7.5	-79%
Nonbank financial	\$6.1	-68%
Oil and gas	\$8.0	-62%
Paper products	\$2.9	-5%
Real estate	\$10.5	-16%
Retail	\$5.1	71%
Technology	\$6.9	-68%
Telecommunications	\$3.2	-49%
Transportation	\$12.8	84%
Total	\$70.4	

* 1 billion = 1,000,000,000

14.

Value of Mergers and Acquisitions for Selected Industries**in the United States, First Quarter 2002**



15.

slackahead

slackahead

**Value of Mergers and Acquisitions for Selected Industries
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Telecommunications	\$3.2	-49%
Transportation	\$12.8	84%
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16.

**Value of Mergers and Acquisitions for Selected Industries
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Telecommunications	\$3.2	-49%
Transportation	\$12.8	84%
Total	\$70.4	

* 1 billion = 1,000,000,000

slackahead

slackahead

In the real estate industry, the percent decrease in the value of mergers and acquisitions from the first quarter of 2002 to the first quarter of 2003 was the same as from the first quarter of 2001 to the first quarter of 2002. If this percent decrease in value was repeated again from the first quarter of 2003 to the first quarter of 2004, which of the following represents the value in the first quarter of 2004?

- \$10.5(0.16) billion
- \$10.5(0.16)² billion
- \$10.5(1.16)² billion
- \$10.5(0.84)² billion
- \$10.5(0.84) billion

Which of the following is closest to the value of mergers and acquisitions for the oil and gas industry in the first quarter of 2001?

- \$5 billion
- \$10 billion
- \$13 billion
- \$18 billion
- \$21 billion

17.

S is the set of all numbers $(k - n)^2$, where k and n are integers such that $4 \leq k < 7 < n \leq 12$. What is the range of the numbers in S?



18.

A certain spacecraft has 2 separate computer systems, X and Y, each of which functions independently of the other. The probabilities that systems X and Y will function correctly at liftoff are 0.90 and 0.99, respectively. What is the probability that at least one system will function correctly at liftoff?

 0.891 0.945 0.955 0.999 0.9999

19.

If a set S has a total of 6 subsets that consist of 2 members each, then S consists of how many members?

20. slackahead
slackaheads

slackahead slackahead
slackaheads slackahead

slackahead slackahead
slackaheads slackahead

The number of children in a certain family is a prime number less than 10. The number of boys in the family is greater than the number of girls, and the number of boys is a prime number. If at least 1 of the children in the family is a girl, which of the following could be the number of boys in the family?

Indicate all such numbers.

slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead 2 slackahead
slackahead 3 slackahead
slackahead 4 slackahead
slackahead 5 slackahead

 6 7



Section 20 Medium

- | | | | |
|------------|---|------------|-------------------|
| | slackahead | slackahead | slackahead |
| 1. | slackahead | slackahead | slackahead |
| slackahead | slackahead | slackahead | slackahead |
| slackahead | slackahead | slackahead | slackahead |
| slackahead | slackahead | slackahead | slackahead |
| | Quantity A | | Quantity B |
| | $(a + \frac{b}{4}) + (\frac{a}{4} + b)$ | | 6 |
| slackahead | slackahead | slackahead | slackahead |

2.

- P, Q, and T are three distinct points in a plane.

P, Q, and T are three distinct points in a plane.

Quantity A

The number of lines in the plane that pass through points P, Q and T

Quantity B

1

3

- When the positive number k is multiplied by itself, the result is $\frac{1}{2}$ of k .

When the positive number k is multiplied by itself, the result is $\frac{1}{2}$ of k .

Quantity A

Quantity B

1
d

4

- The set S consists of all of the different ordered pairs (x, y) for which x is a positive integer less than 50 and $y = \frac{1}{2}x + 10$.

The set S consists of all of the different ordered pairs (x, y) for which x is a positive integer less than 50 and $y = \frac{1}{2}x + 10$.

Quantity A

The number of ordered pairs in S for which y is not an integer

Quantity E

2

The sum of 101 consecutive even integers is 20,200.

Quantity A

The average (arithmetic mean) of the 101 integers

Quantity B

The median of the 101 integers



6.

Michael ate $\frac{1}{6}$ of the cookies in a full jar of cookies, and Tess ate $\frac{1}{7}$ of the remaining cookies in the jar.

Quantity A

The fraction of the cookies in the full jar that were not eaten by either Michael or Tess

Quantity B $\frac{5}{7}$

7.

Triangle ABC is equilateral. Vertices P, Q, and R of triangle PQR lie on sides AB, AC, and BC, respectively.

Quantity A

The sum of the measures of two of the interior angles of triangle ABC

Quantity B

The sum of the measures of two of the interior angles of triangle PQR

8.

n is a positive integer.

Quantity A

The remainder when 3^{4n} is divided by 10

Quantity B

1

9.

What is the sum of all the possible different 3-digit positive integers that can be formed using each of the digits 7, 8, and 9, without repetition?

10.

Which of the following indicates all values of b such $(x - b)^2 + 1$ is positive?

 $b \leq 0$ $0 \leq b \leq 1$ $b \leq x$ All real numbers b



11.

A demographic study describes a group of corporation executives and non executives having an average (arithmetic mean) age of 42 years. If the executives in the group average 40 years of age and the nonexecutives average 45 years of age, what is the ratio of the number of executives to the number of non executives in the group?

2 to 1

3 to 1

3 to 2

4 to 3

5 to 3

12.

A restaurant has a total of 16 tables, each of which can seat a maximum of 4 people. If 50 people were sitting at the tables in the restaurant, with no tables empty, what is the greatest possible number of tables that could be occupied by just 1 person?

13.

It cost a certain company a total of \$4,200.00 to make and sell 3,000 widgets. If the company sold each of the 3,000 widgets for \$2.10, what was the company's profit per widget? (Profit is equal to the selling price minus the cost)

\$

slackahead

slackahead

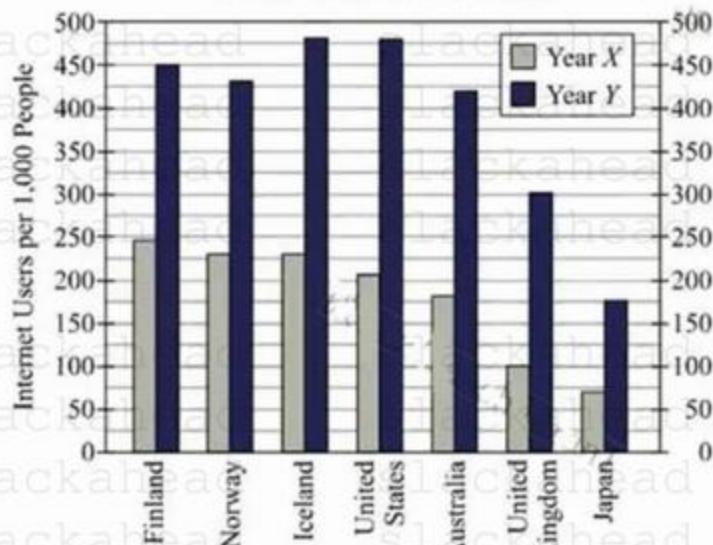
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slackahead

slackahead

14.

**Internet Usage in Year X and Year Y
For Seven Selected Countries**



If the population of the United Kingdom was 60 million in year X, which of the following is closest to the total number of Internet users in the United Kingdom in year X?

0.6 million

1 million

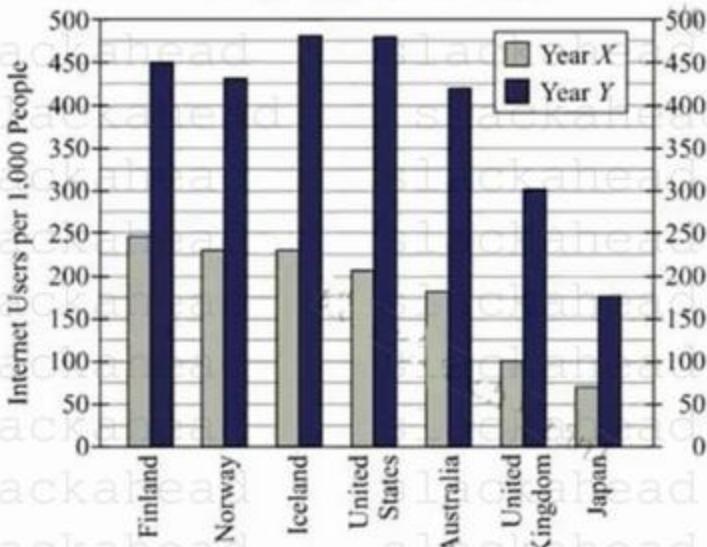
6 million

10 million

16 million

15.

**Internet Usage in Year X and Year Y
For Seven Selected Countries**



In year X, for how many of the countries shown was the number of Internet users greater than 15 percent of the population of that country?

None

Four

Five

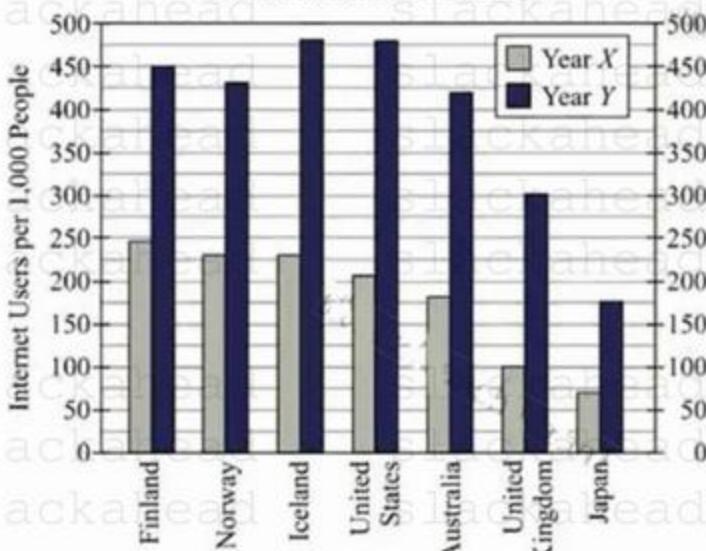
Six

Seven

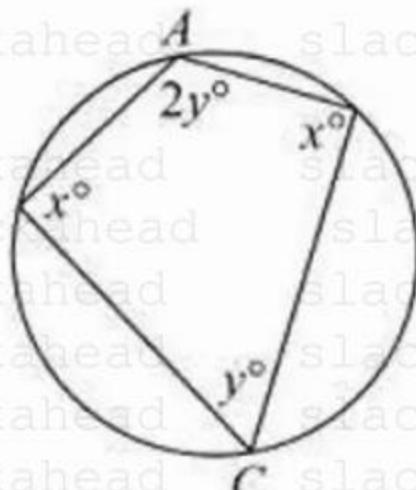
16.



**Internet Usage in Year X and Year Y
For Seven Selected Countries**



17.



In the figure above, a quadrilateral is inscribed in a circle. Line segment AC (not shown) is a diameter of the circle. What is the value of $x+y$?

$$x+y = \underline{\hspace{2cm}}$$

In year Y, the ratio of the number of Internet users per 1,000 people in Finland to the number of Internet users per 1,000 people in Japan was closest to which of the following?

2 to 1

3 to 2

4 to 1

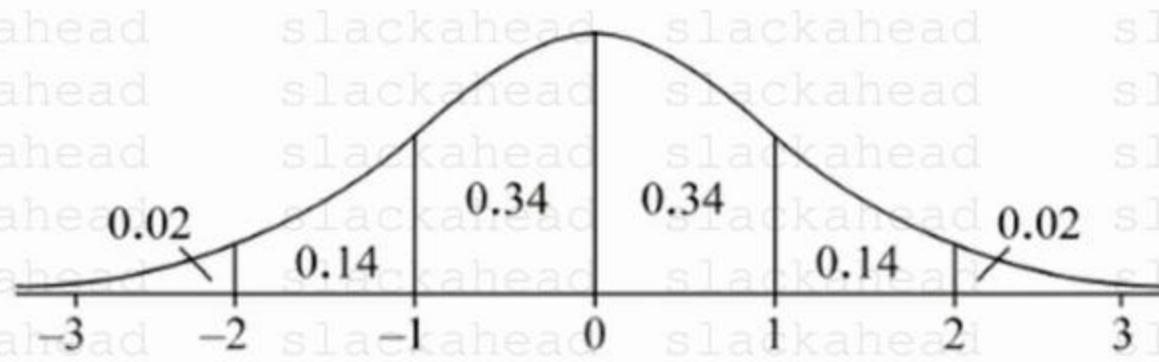
4 to 3

5 to 2



- If k is the sum of three consecutive odd integers x , y , and z , where $x < y < z$, what is the sum of the three consecutive odd integers that immediately follow z ?

19. If n is a positive integer, which of the following CANNOT be the units digit of $2^n - 1$?



The figure above shows a normal distribution with mean m and standard deviation d , including approximate percents of the distribution corresponding to the six regions shown.

The lengths of phone calls made on a certain weekend by students at High School H are approximately normally distributed with a mean of 30 minutes and a standard deviation of 10 minutes. Which of the following statements must be true?

Indicate all such statements.

- The range of the lengths of the phone calls is less than 60 minutes.
 - The lengths of half of the phone calls are each greater than 40 minutes.
 - The length of a 35-minute phone call is 0.5 standard deviation from the mean of the lengths of the phone calls.

Section 21 Hard

1.

Square ABCD is inscribed in a circle of radius 3.

Quantity A

The area of square region ABCD

Quantity B



10.

Machine X, working at a constant rate, can perform a job in T hours. Machine Y, working at a different constant rate, can perform the same job in $3T$ hours. If the two machines work simultaneously at their respective constant rates, how many hours will it take for the machines to perform the job, in terms of T?

- slackahead slackahead slackahead slackahead
 slackahead slackahead slackahead slackahead
 slackahead $\circ \frac{T}{2}$ slackahead slackahead
 slackahead $\circ \frac{T}{3}$ slackahead slackahead

- slackahead $\circ \frac{2T}{3}$ slackahead slackahead slackahead
 slackahead $\circ \frac{3T}{4}$ slackahead slackahead
 slackahead $\circ \frac{4T}{5}$ slackahead slackahead

11.

If $p=r^n$, where r is a prime number, and n is a positive integer, then define $p\Delta=p^*n$. For example, $25=5^2$, then $25\Delta=25*2=50$.
Therefore, what is the value of 32Δ ?

slackahead
slackahead
slackahead
12.

slackahead slackahead slackaheads slackahead
slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead

For a list of 10 different numbers, the average (arithmetic mean) of the numbers is 22 and the range is 50. If both the least number and the greatest number are removed from the list, then the average of the remaining numbers is 20. What is the greatest number in the list of 10 numbers?

- slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead
 slackahead $\circ 55$ slackahead slackahead
 slackahead $\circ 52$ slackahead slackahead
 slackahead $\circ 45$ slackahead slackahead
 slackahead $\circ 42$ slackahead slackahead



13.

A circular walkway with a uniform width and an inner diameter of 60 feet is to be built. If the length of the outer edge of the walkway must be between 100π feet and 200π feet, which of the following values could be the width, in feet, of the walkway?

Indicate all such values.

 30 60 90 120

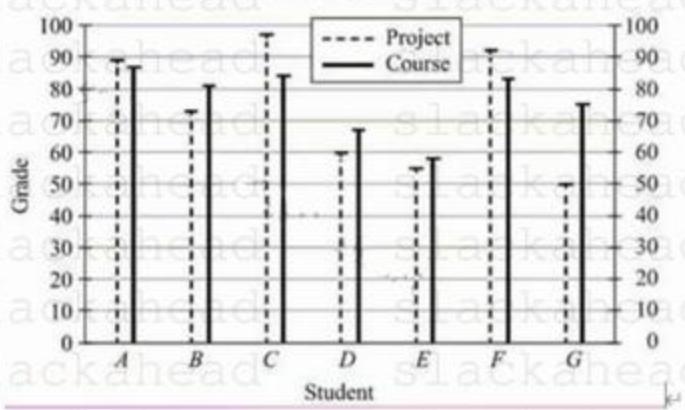
14.

Performance of Seven Students in a Journalism Course

Reading and Writing Statistics

Student	Number of Articles Read	Number of Words Read (in thousands)	Number of Articles Written	Number of Words Written (in thousands)
A	31	27.9	5	6.4
B	19	22.5	9	8.2
C	27	24.4	8	9.6
D	28	28.4	8	7.5
E	17	23.6	7	6.0
F	40	31.0	10	9.1
G	30	26.4	11	9.9

Project Grade and Course Grade



Which student wrote the longest articles as measured by the average (arithmetic mean) number of words per article?

 A B C F G



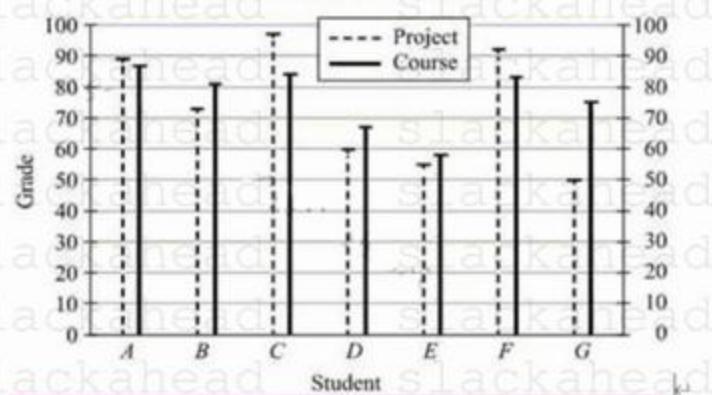
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E	17	23.6	7	6.0
F	40	31.0	10	9.1
G	30	26.4	11	9.9

Project Grade and Course Grade



Reading and Writing Statistics

The greatest number of words read by a student exceeded the least number of words read by a student by approximately what percent?

- 9%
- 18%
- 27%
- 33%
- 38%

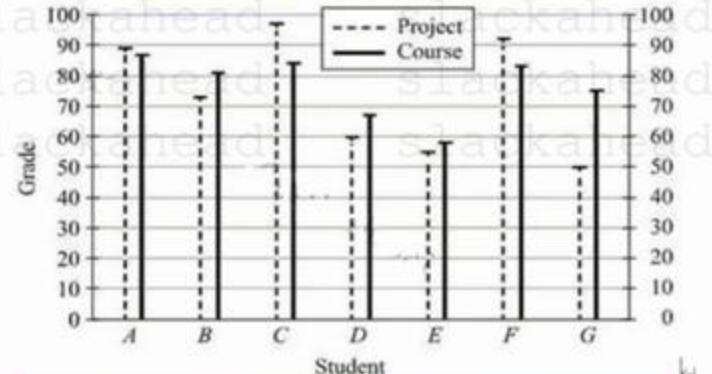
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G	30	26.4	11	9.9

Project Grade and Course Grade



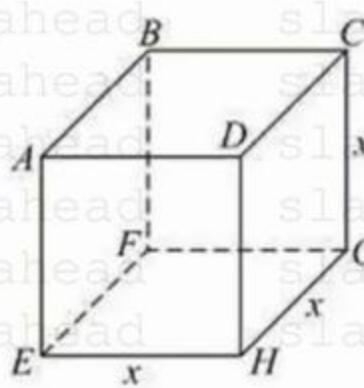
Reading and Writing Statistics

Of all the articles read, students C, D, and E read the same 2 articles. In addition to these 2 articles, C and D read the same 10 articles, C and E read the same 5 articles, and D and E read the same 7 articles. How many articles were read by at least one of the three students, C, D, and E?

- 42
- 44
- 46
- 48
- 50



17.



The cube shown above has edges of length x , where x is an integer. The length of diagonal AG (not shown) is 10.39, to the nearest 0.01. What is the value of the integer x ?

$$x = \underline{\hspace{2cm}}$$

18.

k , m , and p are integers.

If k and m are negative integers, which of the following must be negative integers?

Indicate all such integers.

$m - p^2$

$(k-1)(p+1)$

kmp

19.

What is the units digit of $(4^{32} - 3^{32})$?



If the probability that event R will occur is 0.75, and the probability that event M will occur is 0.58, which of the following is equal to the maximum probability that both events will occur?

- ckahead
○ 0.58
ckahead
○ 0.75
ckahead
○ 0.58+0.75

- $$\textcircled{O} \quad \frac{(0.58+0.75)}{2}$$

- $$\textcircled{O} \quad 0.58 + 0.75 - (0.58)(0.75)$$

Section 22 Medium

1.

Quantity A

[x]

Quantity B

2

PQST is a parallelogram and R is the midpoint of side PT.

Quantity A

The area of triangular region PQR

Quantity B

The area of triangular region RST

n is an integer.

$$\text{Quantity A}$$

Quantity B

1



4.

- slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
5. slackahead

Quantity A

x

- slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

$$\frac{2}{\pi} = \frac{y}{2}$$

- slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

Quantity B

y

- slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

Terry deposits a total of \$400 in two different accounts. One account pays 3 percent annual interest and the other pays 5 percent annual interest. The total yearly interest on these investments is \$16.

Quantity A

The amount of money that is invested in the account
that pays 3 percent annual interest

6. The area of square region S is equal to the area of circular region C.

Quantity B

The amount of money that is invested in the account
that pays 5 percent annual interest

- slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

Quantity A

The length of a diagonal of S

Quantity A

The number of integers in S in which all three digits
are different

7. slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
8. slackahead

For a positive integer n, the remainder is 3 when it is divided by 7, and the remainder is R when it is divided by 4.

The length of a diameter of C

Set S consists of all three-digit positive integers that contain only the digits 1, 2, 3, 4, or 5.

Quantity B

60

Quantity A

R

Quantity B

2



9

For $x=97$, which of the following is equal to $\frac{1}{x^2}$?

Which fraction has the least value?

10.

If the average (arithmetic mean) of 5 numbers is 10, then the sum of the 5 numbers is 50.

) of three consecutive odd integers.

11, then 7 more than the least of

For $x=97$, which of the following fractions has the least value?

○ $\frac{97}{x}$

○ $\frac{x+}{x}$

gers is

○ 19
○ 20

Oz



12.

If two different numbers are selected at random from the numbers 1, 2, 3, 4, and 5, what is the probability that their product will be odd?

- $\frac{1}{2}$
 $\frac{1}{12}$
 $\frac{1}{20}$

13.

Last spring, a gardening store bought 100 trees for \$6 each to resell to customers. By the end of the year, 20 of the trees were sold for \$30 each, 30 of the trees were sold for \$50 each, 40 of the trees were sold for \$60 each, and 10 of the trees were damaged and not sold. For the 100 trees, what was the average (arithmetic mean) profit per tree?

\$ _____

14.

Measures Planned to be Used to Offset Rising Energy Cost:

Survey Results for 1,600 Companies

Measure	Percent of Companies
Absorb increased costs	48%
Consolidate debt	15%
Cut research and development	10%
Increase prices	41%
Negotiate raw-material costs	23%
Reduce workforce	18%
Trim advertising and marketing	12%

An analyst estimates that of the companies surveyed that plan to increase prices, 75 percent will actually increase prices. According to the analyst's estimate, what is the number of companies surveyed that plan to increase prices but will not actually increase prices?

- 164
 262
 381
 547
 640



15.

Measures Planned to be Used to Offset Rising Energy Cost:

Survey Results for 1,600 Companies

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Cut research and development	10%
Increase prices	41%
Negotiate raw-material costs	23%
Reduce workforce	18%
Trim advertising and marketing	12%

slackahead

slackahead

For the seven measures shown, what is the median of the numbers of companies surveyed that plan to use the measures?

656

548

402

368

288

The number of companies surveyed that plan to trim advertising and marketing is what percent less than the number of companies surveyed that plan to consolidate debt?

15%

20%

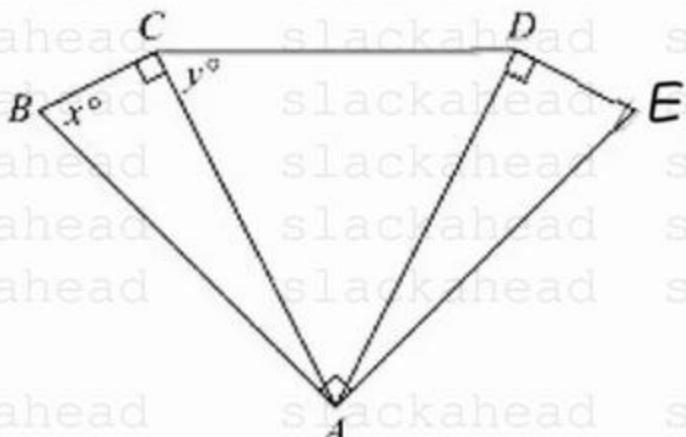
25%

30%

35%



A diagram of a triangle with one vertex pointing downwards. The angle at the top-left vertex is labeled x° .



Triangles ABC and AED are congruent, where BC=DE. If $y=63$, what is the value of x ?

x = _____

slackahead
slackahead
what is the value of x?
slackahead
slackahead
slackahead
slackahead
slackahead

18.

The first term of an infinite sequence?

ence is 4, and each term after the first term is 7 greater than the pre-
slackahead slackahead
slackaheads slackahead
slackahead slackahead
slackahead slackahead
slackahead ○ 188 slackahead
slackahead ○ 431 slackahead
slackahead ○ 445 slackahead
slackahead ○ 448 slackahead
slackahead ○ 452 slackahead
slackahead slackahead
slackahead slackahead



19.

A wall in a museum is covered by 60 flat rectangular panels. If the dimensions of each panel are 4 feet by 7.5 feet, what is the total area, in square yards, of the panels? (Note: 1 yard = 3 feet.)

- 200
- 600
- 1,800

20.

A research report states that the average (arithmetic mean) of 120 measurements was 72.5, the greatest of the 120 measurements was 92.8, and the range of the 120 measurements was 51.6.

The information given above is sufficient to determine the value of which of the following statistics?

Indicate all such statistics.

- The least of the 120 measurements
- The median of the 120 measurements
- The standard deviation of the 120 measurements
- The sum of the 120 measurements

Section 23 Hard

1.

Last year and this year, there were both men and women in a certain choir. This year there are x fewer men and x fewer women in the choir than there were last year, where $x > 0$, and there are fewer men than women in the choir.

Quantity A

The percent decrease from last year to this year in the number of men in the choir

Quantity B

The percent decrease from last year to this year in the number of women in the choir



2.

slackahead

slackahead

slackahead

slackahead

Quantity A

The standard deviation of the numbers 45, 64, 83, and
53

Quantity B

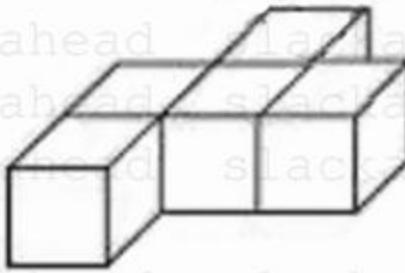
The standard deviation of the numbers 55, 81, 47, and
62

slackahead

3.

$$s = t$$

slackahead



The solid shown consists of five cubes, each with a volume of 27, that are joined so that four pairs of faces coincide.

Quantity A

The surface area of the solid

Quantity B

198

5.

For all numbers x , the function $h(x)$ is defined as 1 more than the greatest integer less than or equal to x .

Quantity A

$h(1.5)$

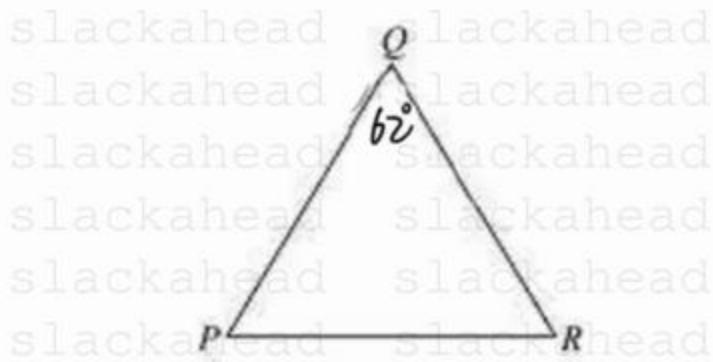
Quantity B

$h(1.75)$



6.

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slackahead
slackahead
slackahead
slackahead
slackahead
slackahead



slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

slackahead
slackahead
slackahead
Quantity A
The measure of angle P
slackahead
slackahead

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
Quantity B
The measure of angle R
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

7. A total of \$24,000 was invested for one month in a new money market account that paid simple annual interest at the rate of r percent.
If the investment earned \$180 in interest for the month, what is the value of r ?

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
8.

- 7.5
- 8.0
- 8.5
- 9.0
- 10.0

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

slackahead
slackahead
slackahead
A total of \$24,000 was invested for one month in a new money market account that paid simple annual interest at the rate of r percent.
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slackahead
slackahead
slackahead
slackahead
slackahead

- 7.5
- 8.0

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

- 8.5
- 9.0
- 10.0



9.

A pianist agreed to perform one concert at a fee $12\frac{1}{2}$ percent less than her usual fee and a second concert at a fee 20 percent greater than the first fee. The fee for the second concert was what percent greater than her usual fee?

A) 5%

B) 7.5%

C) 15%

D) 16.25%

E) 32.5%

10.

A set consists of all three-digit positive integers with the following properties. Each integer is of the form JKL, where J, K, and L are digits; all the digits are nonzero; and the two-digit integers JK and KL are each divisible by 9. HOW many integers are in the set?

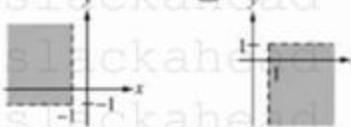
A) 100
 B) 1000
 C) 10000
 D) 100000
 E) 1000000

11.



A) The region above the line $y = x + 1$ and below the line $y = -x - 1$.
 B) The region above the line $y = x + 1$ and below the line $y = -x + 1$.
 C) The region above the line $y = x - 1$ and below the line $y = -x + 1$.
 D) The region above the line $y = x - 1$ and below the line $y = -x - 1$.
 E) The region above the line $y = x + 1$ and below the line $y = -x - 1$.

Which of the following shaded regions represents the set of all points (a,b) in the xy -plane above such that $(a+1, b+1)$ is in quadrant 1? (note that a point lies on an axis is not in any quadrant)



A) Graph A
 B) Graph B
 C) Graph C
 D) Graph D
 E) Graph E

F) Graph F



12.

A certain list has 5 entries and each entry is an integer between 55 and 70, inclusive. The median of the 5 entries is 60. If m is the average (arithmetic mean) of the 5 entries, which of the following must be true?

$54 \leq m \leq 60$

$55 \leq m \leq 61$

$56 \leq m \leq 62$

$57 \leq m \leq 63$

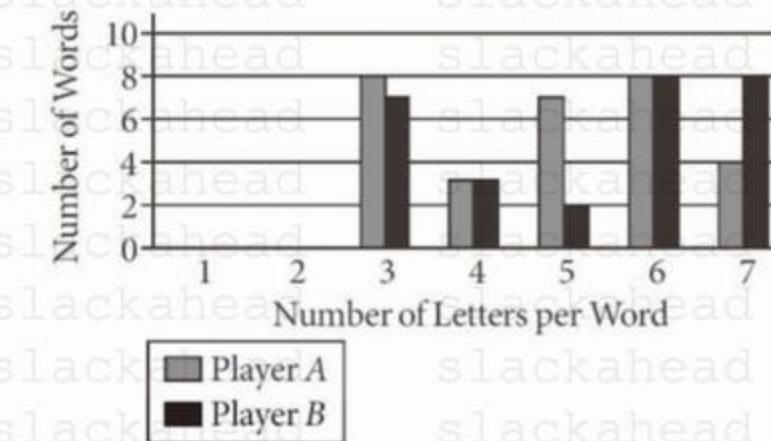
$58 \leq m \leq 64$

13.

List L consists of 11 different positive numbers. The sum of the 6 smallest numbers in L is 35, and the sum of the 6 greatest numbers in L is 125. If the sum of all the numbers in L is 142, what is the median of the numbers in L?

14.

Number of Words Listed by Players A and B



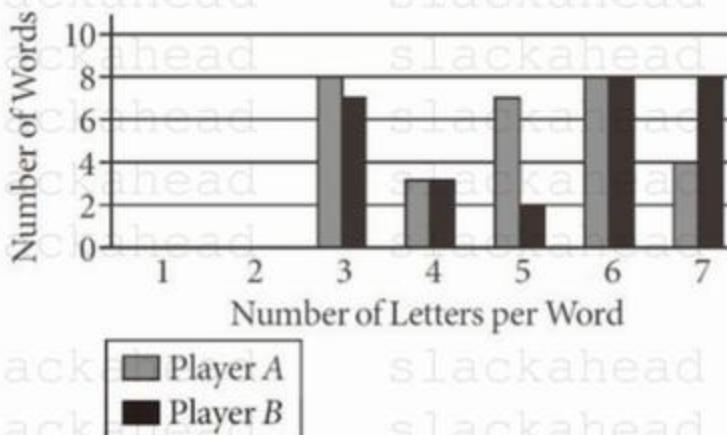
The graph shows the results of a word game in which two players were given identical sets of 12 different letters. Using only the 12 letters, each player listed as many words as the player could think of in three minutes, without repeating any letters within a word. Neither player listed a word with fewer than 3 or more than 7 letters.

In order to determine the scores for the players, each word listed with 3 or 4 letters was given 1 point, each word listed with 5 or 6 letters was given 2 points, and each word listed with 7 letters was given 3 points. The score for each player was the sum of the points given for the words that the player listed. What was the absolute value of the difference between the score for Player A and the score for Player B?

_____ point(s)

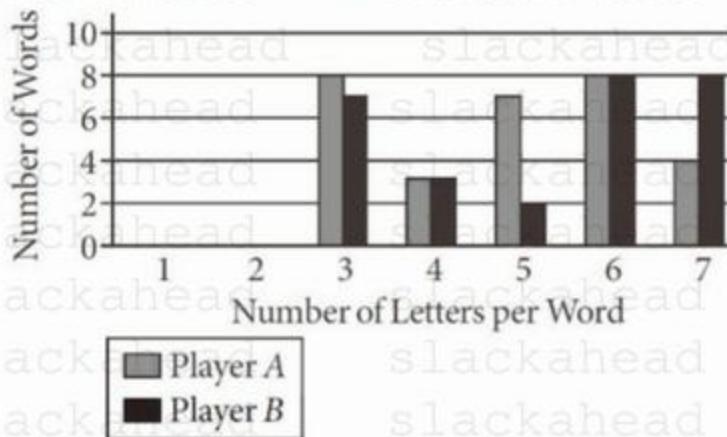


15.

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slackahead

Of the 3-letter words listed by Player A or Player B, 4 words were listed by both players. How many of the 3-letter words listed were listed by only one of the two players?

7

8

11

15

19

What is the average (arithmetic mean) number of letters per word in the words listed by Player B?

4.95

5.00

5.25

5.50

6.00



17.

slackahead

slackahead

slackahead

slackahead

A certain museum contains a total of 1,500 works of art, of which 800 are paintings. Of the twentieth-century works of art in the museum, 40 percent are paintings. Of the works of art that are not paintings, 490 are not twentieth-century works of art.

How many twentieth-century works of art does the museum contain?

slackahead

18.

$$\text{slackahead } 1+2+3+\dots+n = \frac{n(n+1)}{2}$$

For each integer n greater than 1, the sum of the first n positive integers is given by the formula shown.

slackahead

slackahead

slackahead

slackahead

If the average (arithmetic mean) of the first n positive integers is k , what is the sum of the first n positive integers in terms of k ?

slackahead

$$\text{O } \frac{k^2 - k}{2}$$

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

$$\text{O } \frac{k^2 + k}{2}$$

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

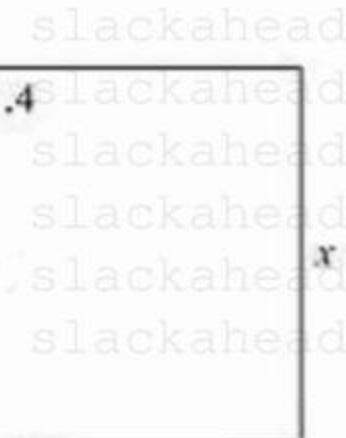
slackahead

$$\text{O } 2k^2 - k$$

slackahead



19.



slackahead
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slackahead
slackahead
slackahead
slackahead

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

slackahead 10.6 slackahead
slackahead slackahead

slackahead slackahead
slackahead slackahead

slackahead slackahead
slackahead slackahead

The figure above represents the floor plan of a basement in which all the walls meet at right angles. The measurements shown in the floor plan, including the two sides of length x , are in centimeters. The floor plan is drawn using a scale of 1 centimeter to 1.5 meters. If the perimeter of the floor is 39.4 centimeters, approximately what is the area, in square meters, of the basement floor?

78

117

122

176

184

slackahead
20. slackahead

slackahead slackahead
slackahead slackahead

slackahead slackahead
slackahead slackahead

Let a be the greatest integer such that 5^a is a factor of 1,500, and let b be the greatest integer such that 3^b is a factor of 33,333,333.

Which of the following statements are true?

Indicate all such statements.

$a \cdot b = 3$

$a = 3b$

$2a > 5b$



Section 24 Research

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1.

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Quantity A x^2

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2.

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Quantity A

The dollar reduction in the price of the jacket

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3.

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Quantity A

The product of the positive prime factors of 30

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4.

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$$(3^x)(3^y)=1$$

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slackahead

Quantity A

$$x+y$$

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5.

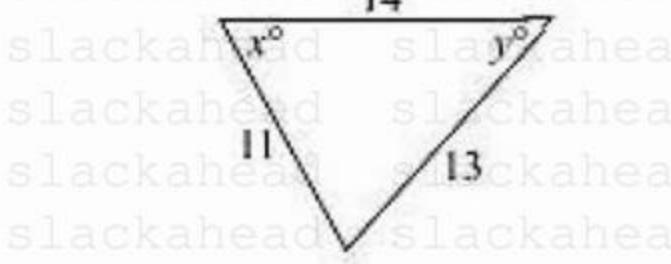
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Quantity A

x

Quantity B

y





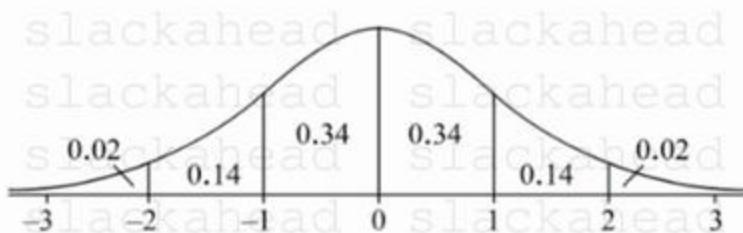
6.

Quantity A
The least possible value of $s+t$

s and t are positive integers such that $st=30$.

Quantity B
13

7.



The figure shows the standard normal distribution, with mean 0 and standard deviation 1, including approximate probabilities corresponding to the six intervals shown.

The random variable X is normally distributed with mean 140 and standard deviation 12.

Quantity A
 $P(125 < X < 131)$

Quantity B
 $P(152 < X < 158)$

8.

Last month Paul and Jack each sold newspaper and Paul sold 5,000 more newspaper than Jack. If Paul and Jack sold a combined total of 35,000 newspaper last month, what fraction of this combined total did Jack sell?

$$\textcircled{O} \frac{3}{10}$$



9.

A shop sells only two types of beverages: coffee and teas. If 36 percent of the shop's beverages are teas that have caffeine and 60 percent of the shop's teas have caffeine, what percent of the shop's beverages are coffees?

- 24%
- 30%
- 40%

50%

60%

10.

List L consists of the integers from 1 to 99 and two integers c and d such that $c+d=100$ and $cd < 0$. Which of the following statements must be true?

Indicate all such statements.

- The average (arithmetic mean) of the numbers in L is equal to the median of the numbers in L.
- The range of the numbers in L is greater than 100.
- The range of the numbers in L is less than 200.

11.

Among the incoming students at a certain college, an equal number of full-time and part-time students received a welcome package. If $\frac{3}{16}$ of the incoming full-time students and $\frac{5}{12}$ of the incoming part-time students received a welcome package, what fraction of the incoming students received a welcome package?

- $\frac{15}{58}$
- $\frac{2}{7}$
- $\frac{29}{96}$

$\frac{9}{29}$

$\frac{19}{48}$



12.

A circle in the xy -plane is given by the equation $(x - a)^2 + (y - b)^2 = c^2$, where a , b , and c are nonzero constants. If the point $(b + a, b - a)$ lies on the circle, which of the following is an equation of the tangent line to the circle at this point?

$y = \frac{a}{b}(x - a - b) + (a - b)$

$y = \frac{a}{b}(x - a + b) + (a + b)$

$y = \frac{a}{b}(x - b + a) + (a + b)$

$y = \frac{b}{a}(x - b + a) + (a + b)$

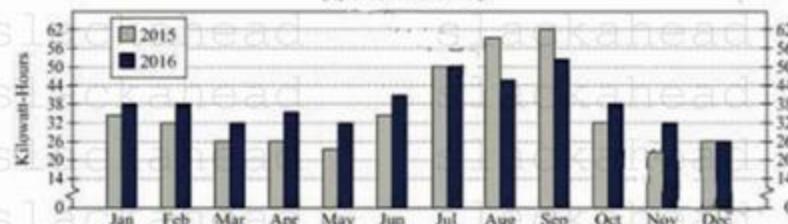
$y = \frac{b}{a}(x - b - a) + (b - a)$

13.

In a game, the cards in a certain deck are distributed to players one at a time until each player has the same number of cards and there are not enough cards left in the deck to distribute one more card to each player. The number of cards in the deck is between 60 and 100. If the cards in the deck are distributed to 5 players, 2 cards will be left in the deck. If the cards in the deck are distributed to 6 players, 4 cards will be left. If the cards in the deck are distributed to 7 players, how many cards will be left in the deck?

14.

Average* Daily Electric Use by Household X for 2015 and 2016 by Month
(in kilowatt-hours)



If the range of the average daily electric use for the months from January to June in 2015 was x kilowatt-hours less than that for the months from July to December in 2015 and if the range of the average daily electric use for the months from January to June in 2016 was y kilowatt-hours less than that for the months from July to December in 2016, approximately what is the value of $x - y$?

1

11

19

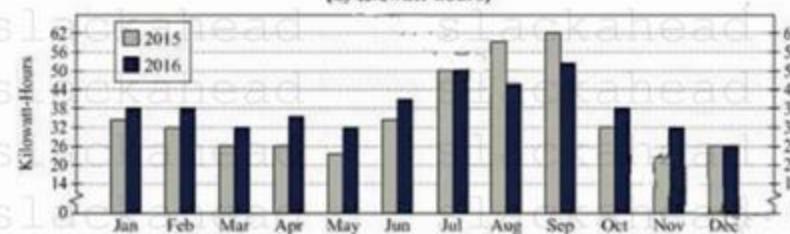
28

38



15.

Average* Daily Electric Use by Household X for 2015 and 2016 by Month (in kilowatt-hours)



The total electric use, in kilowatt-hours, for the 31 days in March, the 30 days in April, and the 31 days in May was approximately how much greater for 2016 than for 2015?

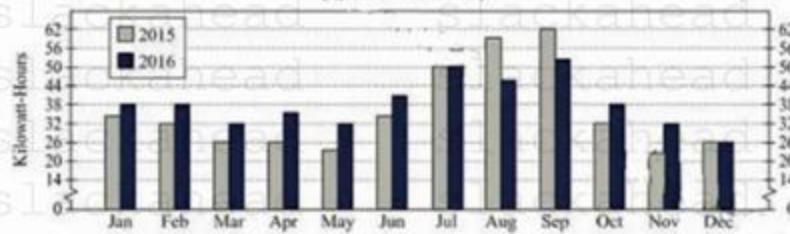
- 30
- 90
- 480

600

730

16.

Average* Daily Electric Use by Household X for 2015 and 2016 by Month (in kilowatt-hours)



What is the ratio of the number of months for which the percent increase from 2015 to 2016 in the average daily electric use was greater than 28 percent to the number of months for which the percent increase from 2015 to 2016 in the average daily electric use was greater than 10 percent?

Give your answer as a fraction.

17.

The standard deviation of n numbers $x_1, x_2, x_3, \dots, x_n$, with mean x , is equal to $\sqrt{\frac{s}{n}}$, where S is the sum of the squared differences, $(x_i - x)^2$ for $1 \leq i \leq n$.

If the standard deviation of the 4 numbers $140-a, 140, 160$, and $160+a$ is 50, where $a > 0$, what is the value of a ?



18.

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Point P lies inside rectangle ABCD so that PA=2, PB=3, and PC=4. What is the value of PD?

- slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead $\textcircled{v} \sqrt{11}$ slackahead
slackahead $\textcircled{v} \sqrt{13}$ slackahead
slackahead $\textcircled{v} \sqrt{20}$ slackahead

$\textcircled{v} \sqrt{21}$

- slackahead slackahead slackahead
slackahead $\textcircled{v} \sqrt{29}$ slackahead
slackahead slackahead slackahead

19. slackahead
slackahead

In sequence T, each term after the first term is d more than the preceding term. The sum of the first 10 terms of T is 210. The sum of the first 20 terms of T is 820. What is the value of d?

- slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead $\textcircled{v} 4$ slackahead
slackahead $\textcircled{v} 4.5$ slackahead

$\textcircled{v} 5$

- slackahead $\textcircled{v} 5.5$ slackahead
slackaheads $\textcircled{v} 6$ slackahead
slackahead slackahead slackahead

20.

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In two equilateral parallelograms, X and Y, the sum of the lengths of the diagonals of X is equal to the sum of the lengths of the diagonals of Y. In X, the length of the longer diagonal is 20 more than the length of the shorter diagonal. In Y, the length of the longer diagonal is 8 more than the length of the shorter diagonal. What is the area of Y minus the area of X?

- slackahead slackahead slackahead
slackahead $\textcircled{v} 336$ slackahead
slackahead slackahead slackahead
slackahead $\textcircled{v} 168$ slackahead
slackahead $\textcircled{v} 84$ slackahead

$\textcircled{v} 42$

$\textcircled{v} 0$



Section 25 Research

1.

In January a company purchased 5,000 gallons of fuel at an average price of \$0.96 per gallon. In February the company purchased 6,000 gallons at an average price of \$0.90 per gallon.

Quantity A

The amount by which the February fuel cost exceeded the January fuel cost

Quantity B

\$600

2.

The lengths of two of the sides of a certain isosceles triangle are 5 and 9.

Quantity A

The perimeter of the triangle

Quantity B

20

3.

$$x^4 = y^4$$

Quantity A

x

Quantity B

y

4.

The operation \bullet is defined for all numbers a and b by the equation $a \bullet b = 3a + 2b$.

Quantity A

$(0 \bullet 1) \bullet 2$

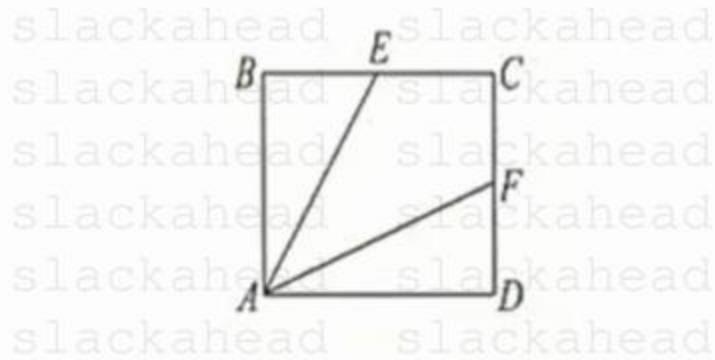
Quantity B

$0 \bullet (1 \bullet 2)$



5.

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ABCD is a rectangle. E and F are the midpoints of sides BC and CD, respectively.

Quantity A

The area of quadrilateral region AECF

Quantity B

$\frac{1}{2}$ the area of rectangular region ABCD

6.

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In a geometric sequence with 100 terms, the first term is positive and each term after the first term is equal to r times the preceding term, where $r > 2$.

Quantity A

The sum of the first 99 terms of the sequence

Quantity B

The last term of the sequence

7.

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slackahead
List P consists of all prime numbers between 30 and 100. List S consists of all odd integers between 30 and 100 that are not prime numbers.

Quantity A

The range of the numbers in P

Quantity B

The range of the numbers in S

8.

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slackahead
 N is the number of ordered pairs (x, y) such that $4y < 12 - 3x$ and each of x and y is a positive integer.

Quantity A

N

Quantity B

3



11.

A continuous random variable R has a mean of 77 and a standard deviation of 8. What is the value of R that is 2.5 standard deviation above the mean?

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79.5

slackahead

85

slackahead

87.5

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12. slackahead

A ball is to be selected at random from a bag containing red balls, green balls, and blue balls. The probability of selecting a red ball is equal to x. If the probability of selecting a green ball equals the probability of selecting a blue ball, what is the probability of selecting a green ball, in terms of x ?

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1-2x

slackahead

slackahead

slackahead

slackahead

1-x

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slackahead

$\frac{1}{3}x$

slackahead

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$\frac{1}{2}x$

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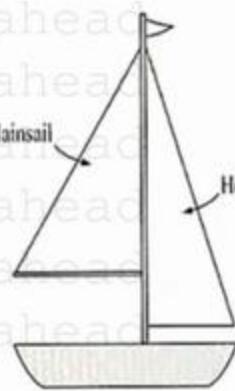
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$\frac{1-x}{2}$

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13.



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A simple sailboat often has two sails, the mainsail and the headsail, as shown in the figure above. A recreational sailor is building a simple sailboat and is designing each sail to be in the shape of a right triangle. The mainsail will have a height of 12 feet and a hypotenuse of length 15 feet. The headsail will have a height of 15 feet and a hypotenuse of length 16.25 feet. Based on the design, the area of the mainsail will be how much greater than the area of the headsail?

Give your answer to the nearest square foot.

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14.

Selected Statistics for Five European Airlines, June 2007

Airline	Passengers		Flights		Passenger Kilometers* (in millions)
	Number (in thousands)	Percent Increase from June 2006	Number (in thousands)	Percent on Time	
A	1,111	9%	25	75%	654
B	614	10%	14	74%	410
C	508	9%	13	83%	260
D	436	19%	5	80%	255
E	404	52%	10	70%	284

*Passenger kilometers for an airline are computed by multiplying for each flight the number of passengers on the flight by the number of kilometers flown and then adding these products for all flights of the airline.

How many of the airlines shown had more than 500,000 passengers in June 2006?

- One
- Two
- Three
- Four
- Five



15.

Selected Statistics for Five European Airlines, June 2007

Airline	Passengers		Flights		Passenger Kilometers* (in millions)
	Number (in thousands)	Percent Increase from June 2006	Number (in thousands)	Percent on Time	
A	1,111	9%	25	75%	654
B	614	10%	14	74%	410
C	508	9%	13	83%	260
D	436	19%	5	80%	255
E	404	52%	10	70%	284

*Passenger kilometers for an airline are computed by multiplying for each flight the number of passengers on the flight by the number of kilometers flown and then adding these products for all flights of the airline.

For Airline D in June 2007, if the average number of passengers per flight was the same for flights that were not on time as it was for all flights, approximately how many passengers were on a flight that was not on time?

- 10,000
- 28,000
- 34,000
- 69,000
- 87,000

16.

Selected Statistics for Five European Airlines, June 2007

Airline	Passengers		Flights		Passenger Kilometers* (in millions)
	Number (in thousands)	Percent Increase from June 2006	Number (in thousands)	Percent on Time	
A	1,111	9%	25	75%	654
B	614	10%	14	74%	410
C	508	9%	13	83%	260
D	436	19%	5	80%	255
E	404	52%	10	70%	284

*Passenger kilometers for an airline are computed by multiplying for each flight the number of passengers on the flight by the number of kilometers flown and then adding these products for all flights of the airline.

Approximately how many passengers did Airline E carry in June 2006?

- 193,000
- 210,000
- 237,000
- 266,000
- 287,000



17.

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The interquartile range of 1,000 measurements is 24, and the range of the 1,000 measurements is 50. Each of the measurements is to be revised by multiplying it by 2 and then subtracting 5 from the product. For the revised measurements, what will be the ratio of the interquartile range to the range?

Give your answer as a fraction.

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18.

If a particle travels at a constant speed of 4 centimeters per second, approximately how many hours will it take for the particle to travel 1 kilometer?

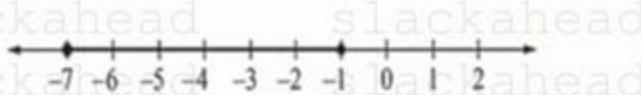
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 134 141 148

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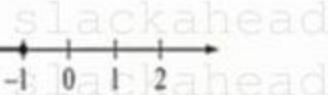


20.



The solution set of which of the following inequalities is graphed on the number line above?

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$$\textcircled{O} |x| \leq 7$$

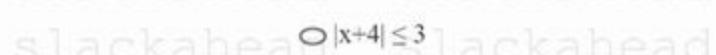
$$\textcircled{O} 1 \leq |x| \leq 7$$



$$\textcircled{O} |x-4| \leq 3$$



$$\textcircled{O} |x+1| \leq 6$$



$$\textcircled{O} |x+4| \leq 3$$



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$$\textcircled{O} |x| > 7$$



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$$\textcircled{O} |x| < 7$$





Special Exercises By Test Point

1.1.1 Digits and values

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1.

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x^* is defined as the 3-digit integer formed by reversing the digits of integer x ; for instance, 258^* is equal to 852. R is a 3-digit integer such that its units digit is 2 greater than its hundreds digit.

slackahead

Quantity A

$R^* \cdot R$

2.

slackahead

Quantity B

200

0^9

$\textcircled{O} 11$

$\textcircled{O} 14$

$\textcircled{O} 19$

$\textcircled{O} 24$



1.1.2 Rounding

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The sum of three different positive integers is 11.

slackahead

slackahead

Which two of the following statements together provide sufficient information to determine the three integers?

Indicate two such statements.

slackahead



1.2.2 Operation of positive and negative numbers

1.

A coffee shop sells its own brand of ground coffee packaged in two sizes-small and large. The small size is priced at k dollars per package, and the large size is priced at m dollars per package. If the total price of 4 packages of the coffee is \$30, which of the following could be the values of k and m ?

Indicate all such values.

 $k=4$ and $m=6$ $k=4$ and $m=16$ $k=5$ and $m=10$ $k=5$ and $m=15$ $k=7$ and $m=8$

2.

-30	-17	-13	-12	-5	2	3	8	22
-4	•	•	•	•	•	•	•	•
-1	•	•	•	•	•	•	•	•
0	•	•	•	•	•	•	•	•
3	•	•	•	•	•	•	•	•
6	•	•	•	•	•	•	•	•

Each • in the table above represents an entry that is the product of the corresponding row and column values. What is the least positive entry of the 45 entries represented in the table?

 0^2 0^3 0^5 0^6 0^9



3.

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slackahead

Each of the offices on the second floor of a certain building has a floor area of either 250 or 300 square feet. The total space of these offices is 5,750 square feet.

Quantity A

The number of these offices with floor areas of 250 square feet

Quantity B

The number of these offices with floor areas of 300 square feet

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1.3.1 Sums and products of consecutive integers

1.

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If the product of 7 consecutive integers is equal to the median of the integers, what is the least of the 7 integers?

slackahead

Quantity A

k

Quantity B

10



1.3.2 Number of consecutive integers

1.

After her graduation, Elena attended her class reunion once every year. The first reunion she attended was in year F and the last was in year L.

Quantity A

The number of reunions Elena attended

Quantity B

L-F

2.

In a list of 350 different positive integers, 70 percent of the integers are less than 500, and the least integer is x.

Quantity A

The greatest possible value of x

Quantity B

255

1.3.3 Odd consecutive integers

1.

List K consists of 25 consecutive integers. The median and the range of the integers in K are equal. What is the greatest integer in K?

2.

List L consists of k consecutive integers, where k is an odd integer. The median of the integers in L is m. Which of the following statements must be true?

Indicate all that is/are true.

The sum of the integers in L is an odd integer.

The least integer in L is equal to $m - \frac{k-1}{2}$

The greatest integer in L is equal to $m + \frac{k+1}{2}$



1.4.1 Definition and properties of odd and even numbers

1.
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slackahead
1, 2, 3, m
slackahead
slackahead
l, 2, 3, n

The first sequence consists of m consecutive integers, and the second sequence consists of n consecutive integers, where m is even and

n is odd.

Quantity A

The percent of integers in the first sequence that are odd

Quantity B

The percent of integers in the second sequence that are even

1.4.2 Parity operations

$$(r+u)(s+t)=\text{odd}, (r+u+s)(u+s+t)=\text{odd}.$$

Which of the following must be true?

r is odd and s is odd

r is even and s is odd

u is odd and t is odd

u is even and t is odd

s is even and t is even



2.

If x and y are positive integers and $x + y = 8x + 22$, which of the following must be true?

x is even.

xy is odd.

$x-y$ is odd.

$x(y+1)$ is even.

x and y are both odd.

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slackahead

slackahead

3.

$$N = xyzwt - (x+y+z+w+t)$$

If N is an even integer and x, y, z, w , and t are integers, which of the following CANNOT be the number of the five integers x, y, z, w , and t that are even?

Zero

One

Three

Four

Five

slackahead

1.4.3 Judgment of Positivity by Index Parity

Quantity A

$$(-1)^n(-1)^{n+2}$$

Quantity B

1



4.

slackahead

If a , b , c are three consecutive positive even integers, which of the following must be an integer?Indicate all that's possible.

slackahead

$\frac{(a+b+c)}{2}$

$\frac{(a+b+c)}{4}$

$\frac{(a+b+c)}{6}$

$\frac{(a+b+c)}{12}$

$\frac{(a+b+c)}{15}$

slackahead

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slackahead

1.5.1 Prime numbers

slackahead

x and y are prime numbers such that $x + y = 43$.

slackahead

slackahead

slackahead

Quantity A

xy

Quantity B

86

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

Quantity A

The number of prime numbers between 4 and 15

Quantity B

The number of prime numbers between 16 and 30

slackahead

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slackahead

List P consists of all prime numbers between 30 and 100. List S consists of all odd integers between 30 and 100 that are not prime numbers.

Quantity A

The range of the numbers in P

Quantity B

The range of the numbers in S



4.

The integer m is the product of four different prime numbers. If the result when m is divided by 35 is a multiple of 3, which of the following could be the result when m divided by 5?

 15 25 42 84 175

1.5.2 Prime Factors

1.

What is the product of the different positive prime factors of 3,528?

 6 14 42 294 441

2.

Quantity A

The number of prime factors of 27

Quantity B

The number of prime factors of 18

3.

$$N = (11)^3 (13)^2 (15)$$

Quantity A

The greatest prime factor of N

Quantity B

15



4.

For every positive even integer n , the function $h(n)$ is defined to be the product of all the even integers from 2 to n , inclusive. If p is the smallest prime factor of $h(100)+1$, then p is?

- Between 2 and 10
- Between 10 and 20
- Between 20 and 30

- Between 30 and 40

- Greater than 50

1.6.1 Definition and Judgment of Factors

1.

Which of the following could be a factor of $\frac{9!}{6! \cdot 3!}$?

Indicate all such numbers.

 2 3 4 5 6 7 8 9



2.

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slackahead slackahead slackahead slackahead
Let a be the greatest integer such that 5^a is a factor of 1,500, and let b be the greatest integer such that 3^b is a factor of 33,333,333.
Which of the following statements are true?

Indicate all such statements.

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slackahead slackahead slackahead slackahead

$a \cdot b = 3$

slackahead slackahead slackahead slackahead

$a = 3b$

slackahead slackahead slackahead slackahead

1.6.2 Number of factors

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1. slackahead

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$$r = (2^3)(3^4)(5^6)$$

$$s = (11^3)(13^4)(17^6)$$

Quantity A

The number of different positive factors of r

Quantity B

The number of different positive factors of s

slackahead

slackahead

2. slackahead

slackahead

$$1,575 = (3^2)(5^2)(7)$$

slackahead

How many positive factors does the integer 1,575 have, including the factors 1 and 1,575?

13

18

32



3.

A certain desk calendar shows the number of the day of the year and the number of days remaining in the year. If the calendar shows 1/364 for Saturday, January 1, what does the calendar show for the Tuesday that is 20 weeks after the first Tuesday in January?

 21/344 141/224 142/223 143/222 144/221

1.6.4 The number of multiples

1.

Quantity A

The number of integers between 10,000 and 25,000
that are multiples of 14

Quantity B

The number of integers between 10,000 and 26,000
that are multiples of 15

2.

If S is the set of positive integers that are multiples of 6, and T is the set of positive integers that are multiples of 8, how many integers between 1 and 100 are in both sets S and T?

3.

Which of the following set has the greatest number of integers from 1 to 100, inclusive?

 The multiple of 3 The multiple of 4 The multiple of 5 The multiple of 3 or 4 The multiple of 4 or 5



1.7.1 Common Multiple and Least Common Multiple

1.

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Quantity A

The least common multiple of k and n

k and n are consecutive positive odd integers.

2.

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Quantity B

Quantity B

kn

The number of attendees at a certain convention is less than 1,000 and is divisible by 50.

Which of the following statement individually provide(s) sufficient additional information to determine the number of attendees at the convention?

Indicate all such statement.

n is divisible by 60.

n is divisible by 90.

n is divisible by 180.

1.7.2 Common factor and greatest common factor

1.

Let $m = (2^3)(3^2)(5)(7^2)$ and $p = (2^2)(3^5)(5^4)(11)$. What is the greatest common divisor of m and p?

(2)(3)(5)

(2²)(3²)(5)

(2)(3)(5)(7)(11)

(2²)(3²)(5)(7)(11)

(2³)(3⁵)(5⁴)(7²)(11)



1.8.1 Definition of quotient and remainder

1.

Each of eight consecutive positive integers is divided by 8, and the resulting remainders are recorded.

Quantity A
The average (arithmetic mean) of the 8 remainders
recorded

Quantity B
3.5

- Quantity A is greater.
- Quantity B is greater.
- The two quantities are equal.
- The relationship cannot be determined from the information given.

1.8.2 Basic remainder

1.

When positive integer n is divided by 53, the remainder is 21, and when positive integer p is divided by 53, the remainder is 25.

What is the remainder when the product np is divided by 53?

k and n are both positive even integers

2.

Quantity A

The remainder when $k^2 + n$ is divided by 2

Quantity B

The remainder when k^n is divided by 2



3. slackahead

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When the positive integer n is divided by 3, the remainder is 1.

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Quantity AThe remainder when n is divided by 5**Quantity B**

2

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Quantity A

The remainder when 11,999,999 is divided by 12

Quantity B

11

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What is the units digit of the sum $13^{10} + 17^{10}$?

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Quantity A

The units digit of N

Quantity B

6

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N is a two-digit integer. The units digit of N^2 is 9.



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3.

slackahead
What is the tens digit of $21^{(3^5)}$?

slackahead

Quantity AThe remainder when 3^{4n} is divided by 10**Quantity B**

1



3.

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Quantity AThe remainder when 3^{64} is divided by 8

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Quantity B

1

slackahead

What is the remainder when 8^{43} is divided by 7?

slackahead

Quantity A

The remainder when 754,975,376 is divided by 4

Quantity B

The remainder when 701,864,294 is divided by 4



4.

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What is the remainder when $(345,606)^2$ is divided by 20?

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1.8.6 Finding general formulas

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Quantity A

The number of values of n that satisfy the three
conditions

Quantity B

4

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Let q be a prime number less than 100. When q is divided by 5, the remainder is 2. When q is divided by 7, the remainder is 6, what is the remainder when q is divided by 8?



3.

slackahead slackahead slackahead slackahead
In a game, the cards in a certain deck are distributed to players one at a time until each player has the same number of cards and there are not enough cards left in the deck to distribute one more card to each player. The number of cards in the deck is between 60 and 100. If the cards in the deck are distributed to 5 players, 2 cards will be left in the deck. If the cards in the deck are distributed to 6 players, 4 cards will be left. If the cards in the deck are distributed to 7 players, how many cards will be left in the deck?

2.1.1 Addition, subtraction, multiplication and division of fractions

slackahead

1.

slackahead

2.

As a result of a chemical reaction between compounds A and B, $\frac{1}{4}$ of each compound was transformed into an equal amount of the other compound, while the remaining $\frac{3}{4}$ of each compound was not transformed. If the amount of B was initially 4 times the amount of A, what was the ratio of the amount of A to the amount of B after the reaction?

slackahead

 1 to 3 3 to 4 4 to 7 7 to 13 7 to 16



2.2.3 Definition of irrational numbers

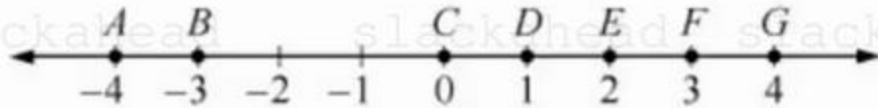
1.

For which of the following values of x does the expression $\sqrt{\frac{24}{x+1}}$ represent an irrational number?

Indicate all such numbers.

 12.5 36.5 53 71 95

2.

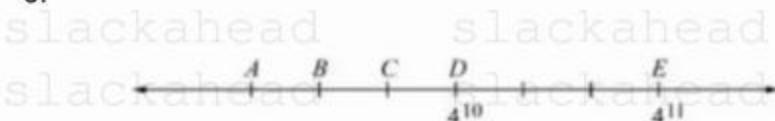


s1 The average (arithmetic mean) of the coordinates of the 7 labeled points on the number line is how much greater or less than the median of the coordinates of the 7 labeled points?

 $\frac{4}{7}$ greater $\frac{3}{7}$ greater $\frac{1}{2}$ greater $\frac{3}{7}$ less $\frac{4}{7}$ less



3.



The tick marks shown on the number line are evenly spaced. Points D and E have coordinates of 4^{10} and 4^{11} , respectively. The point that has a coordinate of 4^9 is?

 point A between Point A and Point B point B between Point B and Point C between Point C and Point D

2.3.2 Absolute value

1.

$$2 < |x-8| < |x-9|$$

slackahead slackahead slackahead

slackahead slackaheads slackahead

slackahead slackahead slackahead

Quantity A

x

Quantity B

6

2.

$$|x-2| > y$$

Quantity A

|x|

Quantity B

y



2.3.3 Absolute value operations in equations

1.

How many distinct solutions does the equation $|1-x-215|=1$ have?

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slackahead slackahead slackahead
slackahead slackahead slackahead

2.

slackahead slackahead slackahead
slackahead $|4x - 12| = 7x + 3$ slackahead
slackahead slackahead slackahead

Quantity A x

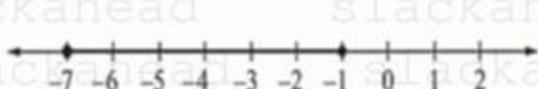
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slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead

Quantity B

0

2.3.4 Absolute value operations in inequalities

1.



The solution set of which of the following inequalities is graphed on the number line above?

$|x| \leq 7$

$1 \leq |x| \leq 7$

$|x-4| \leq 3$

$|x+1| \leq 6$

$|x+4| \leq 3$



2.4.1 Description of percentage relationship and multiple relationship 1

1.

Of the paperbacks in a private library, 5 percent are biographies. If 3 percent of all the books in the library are paperbacks that are biographies, what percent of all the books in the library are paperbacks?

2%

15%

30%

48%

60%

2.

During a certain month, 20 percent of all the electricity used by a household was used by the water heater. The cost per kilowatt-hour of the electricity used by the water heater was half the cost per kilowatt-hour of the rest of the electricity used. For that month, the cost of the electricity used by the water heater was what fraction of the cost of the electricity used by the household?

$\frac{1}{20}$

$\frac{1}{9}$

$\frac{1}{8}$

$\frac{1}{5}$

$\frac{1}{3}$



3.

All the chairs in a certain cargo have the same weight, and all the tables in the cargo have the same weight. There are 6 times as many chairs as there are tables. The weight of each table is 9 times the weight of each chair. If the total weight of the tables is 1,200 kilograms, then the total combined weight of the chairs and tables is how many kilograms?

 1,500 1,800 2,000 2,400 3,000

2.4.2 Description of percentage relationship

1.

Three different television models-K, N, and P-are for sale at a local store. The cost of model K is 20 percent greater than the cost of model N, and the cost of model N is 25 percent greater than the cost of model P. The cost of model K is what percent greater than the cost of model P?

 %

2.

If x and y are positive and x is 43 percent greater than y , then y must be what percent less than x ?

Give your answer to the nearest whole percent.

 %

2.4.3 Description of percentage increase and decrease relationship



1.

A realtor sold two storefront properties. The realtor sold one of the properties for a profit of 25 percent of its original purchase price and the other property for a loss of 25 percent of its original purchase price. If the realtor sold each property for \$210,000, by what amount did the sum of the original purchase prices of the two properties exceed \$420,000?

\$0

\$14,000

\$28,000

\$36,000

\$42,000

2.

Three lamps had the same original price, but they were sold at different selling prices: A, B, and C.

Selling price A was obtained by applying a 75 percent discount to the original price.

Selling price B was obtained by applying a 50 percent discount to the original price and then applying a 25 percent discount to the discounted price.

Selling price C was obtained by applying a 60 percent discount to the original price and then applying a 15 percent discount to the discounted price.

Which of the following shows A, B, and C listed in order from least to greatest?

A, B, C

A, C, B

B, C, A

C, A, B

C, B, A

2.5.2 Work efficiency questions

1.



Machines A and B each assembled 3,000 metal clips in 15 hours and 12 hours, respectively, working alone at their constant rates. On Monday, working simultaneously at their respective constant rates, the two machines assembled a total of n clips in x hours. The next day, machine A was modified so that its constant rate decreased by 25 percent. If the two machines worked simultaneously at their respective constant rates for x hours after the modification of machine A, then the total number of clips that they assembled in x hours was approximately what percent less than it was the day before?

- slackahead
- slackahead
- slackahead
- slackahead $\textcircled{O} 6\%$
- slackahead
- slackahead $\textcircled{O} 11\%$

- slackahead $\textcircled{O} 16\%$
- slackahead $\textcircled{O} 20\%$
- slackahead $\textcircled{O} 25\%$
- slackahead
- slackahead
- slackahead

2.

Working alone at their respective constant rates, an outlet pump can empty a certain tank of water in 7 hours when the tank is initially full, and an inlet pump can fill the tank in 10 hours when the tank is initially empty. Beginning with a full tank, both pumps work simultaneously at their respective constant rates for 1 hour before the inlet pump is shut off. How many more hours would it take the outlet pump working alone to empty the tank?

- slackahead
- slackahead $\textcircled{O} 6.1$
- slackahead $\textcircled{O} 6.3$
- slackahead $\textcircled{O} 6.5$
- slackahead $\textcircled{O} 6.7$
- slackahead $\textcircled{O} 6.9$
- slackahead
- slackahead
- slackahead
- slackahead
- slackahead



slackahead

slackahead

slackahead

slackahead

2.5.3 Speed and distance problems

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slackahead

slackahead

When driving a car at a constant speed of 50 miles per hour the driver decided to apply the brake. How many feet did the car travel during the $\frac{3}{4}$ second that elapsed between the time the driver decided to apply the brake and the time the driver actually started to apply the brake? (1 mile=5,280 feet)

_____feet

slackahead

It is 500 kilometers between city G and city N. A person named A drives from G to N with the speed of 80 kilometers/hour, a person named B drives from N to G with the speed of 70 kilometers/hour. How many kilometers are between the two people with city N when they meet each other?

Give your answer as a fraction.

slackahead

Joey drove from home to work at an average speed of 60 miles per hour, and he drove the same distance from work to home at an average speed of 40 miles per hour. If his total driving time was 2.5 hours, what was the distance, in miles, Joey drove from home to work?

slackahead



2.5.4 Solution and Concentration Problems

1.

Solution A contains x percent alcohol by volume. Solution B contains y percent alcohol by volume. If 3 liters of solution A are mixed with 5 liters of solution B to yield 8 liters of solution C, what percent of the volume of solution C is alcohol?

$$\textcircled{O} \frac{3x+5y}{8}$$

$$\textcircled{O} \frac{\frac{3}{x} + \frac{5}{y}}{8}$$

$$\textcircled{O} \frac{\frac{3}{x} + \frac{5}{y}}{8}$$

$$\textcircled{O} \frac{8(3x+5y)}{100}$$

$$\textcircled{O} 8(3x+5y)$$

2.5.5 Comprehensive ratio problem

1.

In region A, 17 percent of the acres that are planted with corn are planted with a certain hybrid seed. In region B, which borders region A, 11 percent of the acres that are planted with corn are planted with the same hybrid seed.

Quantity A

Of all the acres planted with corn in region A and region B combined, the percent of acres that are planted with the hybrid seed

Quantity B

14%



2.5.6 Piecewise Function Problems

1.

A certain charity is conducting a fund-raiser. For the first \$9,000 raised by the charity, Company B will contribute \$1 for every \$3 collected by the charity. For any amount over \$9,000 raised by the charity, Company B will contribute \$2 for every \$5 collected by the charity. How much money must the charity raise in order to reach a total of \$68,000, including the contribution from Company B?

\$34,000

\$40,000

\$45,000

\$49,000

\$56,000

2.5.7 The Simple Interest Problem

1.

Quantity A

The annual simple interest rate if \$200 earns \$50
interest in 3 years

Quantity B

The annual simple interest rate if \$600 earns \$90
interest in 2 years

2.

Thomas' daughter plans to begin college 6 years from now. Thomas plans to open a new college savings account that pays interest at the annual rate of 2.2 percent, compounded annually. Which of the following is closest to the amount of the initial deposit that Thomas should make if he plans to have \$20,000 in the account at the end of 6 years, provided that there will be no transactions in the account other than the initial deposit and the interest payments?

\$17,552

\$17,668

\$17,938

\$18,054

\$18,170



2.5.9 The Handshake Problem

1.

The 9 computers in an office are to be interconnected by cables so that each computer is connected directly to each of the other computers. If each cable that connects a pair of the computers counts as one cable, how many cables are needed?

2.

For 7 soccer ball teams, each of them has to play with all the other teams. However, to decide which team wins, every two teams have to play 3 rounds and the team that win for the most times will ultimately win. How many rounds of game do all teams have to play in total?

slackahead

2.5.10 The Drawer Problem

1.

A box contains 100 purple balls, 100 red balls, and 100 white balls. What is the minimum number of balls that must be chosen to ensure that at least 4 of the balls chosen have the same color?



2.

A box contains 30 marbles of which 6 are red, 7 are blue, 8 are yellow, and the rest are green. Marbles are selected randomly from the box one at a time without replacement. The selection process stops as soon as 2 marbles of different colors have been selected. What is the greatest number of selections that might be needed in order to stop the process?

10

9

8

7

6

2.5.11 Problems of Rounding Unknown Numbers

1.
slackahead
slackahead

There are n positive integers. The sum of the numbers is greater than 48, while the arithmetic average of the numbers is 1.2. What is the least value of n ?

slackahead
slackahead
slackahead

2.
slackahead
slackahead
slackahead

If a , b , and c are positive integers such that $\frac{a}{c} = 0.075$, and $\frac{b}{c} = 0.09$, What is the least possible value of c ?

slackahead
slackahead
slackahead
slackahead
slackahead



3.1.2 Commonly used identities

slackahead

$b+q$

$b+2bq+q^2$

slackahead

Quantity A
 The product of $(\sqrt{n+1} - \sqrt{n-1})$ and $(\sqrt{n+1} + \sqrt{n-1})$

Quantity B
 2^{n-1}

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3.1.3 Algebraic expression ratios

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r, s, and t are number on the number line above.

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Quantity A

$\frac{rs}{t}$

slackahead

slackahead

Quantity B

rst

slackahead

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2. slackahead

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List S consists of n different positive values, where n is greater than 1. List T consists of the squares of the n values in S.

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Quantity A

The square of the range of the values in S

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Quantity B

The range of the values in T

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3. slackahead

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Quantity A

$\frac{x^3}{9}$

slackahead

slackahead

Quantity B

$(\frac{x}{9})^3$

slackahead

4. slackahead

Quantity A

$x+y$

slackahead

slackahead

Quantity B

$\frac{1}{x} + \frac{1}{y}$

slackahead



2.

$$(2.82 \times 10^{-51}) - (3.96 \times 10^{-49}) =$$

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slackahead

-3.9318×10^{-49}

slackahead

slackahead

-1.7804×10^{-51}

slackahead

slackahead

-1.14×10^{-100}

slackahead

slackahead

1.7804×10^{-51}

slackahead

slackahead

3.9318×10^{-49}

slackahead

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3.2.2 Increase and decrease trends of the index

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1.

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$0 < a < b < 1$

c and d are positive integers such that c < d

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slackahead

Quantity A

a^{c-d}

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slackahead

Quantity B

b^{d-c}

slackahead

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1.

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slackahead

If $1 < r < s < t < 2$, then, of the following, which is closest to $r + (s * 10^6) + (t * 10^{12})$?

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slackahead

slackahead

slackahead

slackahead

slackahead

$(r + s + t) * 10^6$

slackahead

slackahead

slackahead

$3s * 10^9$

slackahead

slackahead

slackahead

$t * 10^{12}$

slackahead

slackahead

slackahead

$(r + s + t) * 10^{12}$

$(r + s + t) * 10^{18}$



3.2.4 Perfect squares and perfect cubes

1.

slackahead

Quantity A

The least positive integer by which 4,500 can be multiplied so that the resulting product is the cube of an integer.

2.

How many integers from 1 to 2,000, inclusive, are both the square of an integer and the cube of an integer?

O 3

O 4

O 12

O 22

O 44

slackahead

slackahead

slackahead

1.

$$\sqrt{(4 + \sqrt{7})(8 - \sqrt{28})} =$$

slackahead

slackahead

slackahead

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slackahead

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Quantity B

6

slackahead

O $2\sqrt{6}$



2.

slackahead

slackahead

slackahead

slackahead

 $\sqrt{500} = k\sqrt{m}$, where k and m are positive integers. What is the greatest possible value of (m+k)?

slackahead

3.

slackahead

$$\frac{x^3}{y^6} = \frac{1}{27}$$

slackahead

slackahead

slackahead

Quantity A

$$3x$$

Quantity B

$$y^2$$

3.3.1 Solving linear equations in one unknown and related problems

slackahead

slackahead

slackahead

slackahead

1.

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

$$3x + 8 - x = 17 + x - 9$$

slackahead

Quantity A

$$x$$

Quantity B

$$1$$

slackahead

slackaheads

slackahead

A candy shop owner decides to create a mixed assortment of candies by mixing two kinds of candies. One kind costs the owner 90 cents per pound, while another costs the owner 70 cents per pound. If the mixed assortment of candies costs the owner 85 cents per pound, and 30 pounds of 90 cents kind is used in the process, then what is the total pounds of mixed candies that can be created?

slackahead

 40 45 50 55 60



3.3.2 Solving Linear Equations in Two Variables and Related Problems

1.

slackahead

slackahead

slackahead

slackahead

$$3x - 2k = 7$$

$$9x - 6k = 21$$

2.

Quantity A

x

slackahead

slackahead

slackahead

slackahead

slackahead

Quantity B

k

slackahead

slackahead

slackahead

slackahead

slackahead

Working continuously for a total of 120 hours, a machine first assembled x units of product A and then assembled y units of product B, where x and y are positive integers. It took the machine 3 hours to assemble each unit of product A and 5 hours to assemble each unit of product B. Which of the following could be the total number of units of product A and product B that the machine assembled in the 120 hours?

Indicate all such numbers.

slackahead

slackahead

slackahead

slackahead

slackahead

3.3.3 Solving Multivariate Linear Equations and Related Problems 1

1.

$$6a + 7b + 8c = 117$$

$$8a + 7b + 6c = 121$$

For the system of equations shown, what is the value of a+b+c?



2.

An organization offers only three types of annual memberships. Basic memberships cost \$50 each, standard memberships cost \$70 each, and premium memberships cost \$100 each. Last year, a total of 200 memberships were purchased at an average arithmetic mean cost of \$80 per membership.

Which of the following statements individually provide(s) sufficient additional information to determine the number of premium memberships purchased last year?

Indicate all such statements

Last year, the number of basic memberships purchased was equal to the number of standard memberships purchased.

Last year, the number of premium memberships purchased was twice the number of basic memberships purchased.

Last year, the number of annual memberships purchased was 100 for one of the three types of annual memberships.

3.4.1 Judgment of the number of roots

1.

The equation $ax^2 = bx^2 + 1$, where a and b are constants, has two real solutions.

Quantity A

a

Quantity B

b

3.4.2 Solving quadratic equations in one variable

1.

One of the solutions of the equation $6x^2 - x - 35 = 0$ is $\frac{n}{2}$, where n is a positive integer. What is the value of n?

n = _____



2. slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
3. slackahead

- slackahead
slackahead $x+\frac{1}{x}=2$
slackahead
Quantity A
 $x^2+\frac{1}{x^2}$
slackahead
slackahead
slackahead

- slackahead
slackahead
slackahead
Quantity B
 $x^3+\frac{1}{x^3}$
slackahead
slackahead
slackahead

A group of people plan to pay \$240 for a facility and split the bill. If 2 of them drop the plan, then the rest of them need to pay \$4 more each. How much do they need to pay each at first?

- slackahead
slackahead
slackahead
slackahead
slackahead
4. slackahead

- slackahead
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- slackahead
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slackahead

In the xy-plane, line k passes through the point (1, 3). If the x-intercept is 2, which of the following is the equation of line k?

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slackahead

- slackahead
slackahead
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- slackahead
slackahead
slackahead

y = -x + 2

- slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

- slackahead y = -x + 6
slackahead y = -2x + 6
slackahead y = -3x + 2
slackahead y = -3x + 6

- slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

3.4.3 Vedder's Theorem

1. slackahead

The function f is defined by $f(x) = x^2 - 18x + 56$ for all numbers x. If r and t are two different numbers such that $f(r) = f(t) = 0$. What is the value of $\frac{r+t}{2}$?

- slackahead

- slackahead

- slackahead



2.

slackahead

slackahead

slackahead

A bowl contains jelly beans, 10 percent of which are green and the rest are blue. To this bowl n green jelly beans and $10n$ blue jelly beans will be added, where $n > 0$.

slackahead

Quantity A

After the $11n$ jelly beans are added to the bowl, the percent of the jelly beans in the bowl that will be green

Quantity B

10%

slackahead

slackahead

slackahead

slackahead

3.

slackahead

Quantity A

$$g^x + \frac{1}{g^x}$$

Quantity B

1

4.

slackahead

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slackahead

slackahead

Quantity A

The area of a rectangular region that has a perimeter of 20 inches

Quantity B

20 square inches

slackahead



slackahead

slackahead

slackahead

slackahead

3.5.3 Inequality Word Problems

slackahead

slackahead

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slackahead

1.

A ball is dropped from a height of 3 meters and bounces repeatedly. After each bounce, it reaches a height that is 65 percent of its previous height. If the height of the ball after the n th bounce is less than 20 centimeters, which of the following could be the value of n^2 ?

Indicate all such values.

slackahead

2.

The degree measure of each angle of a regular polygon with n sides is between 100 and 130. Which of the following could be the value of n ?

Indicate all such integers.

slackahead

slackaheads

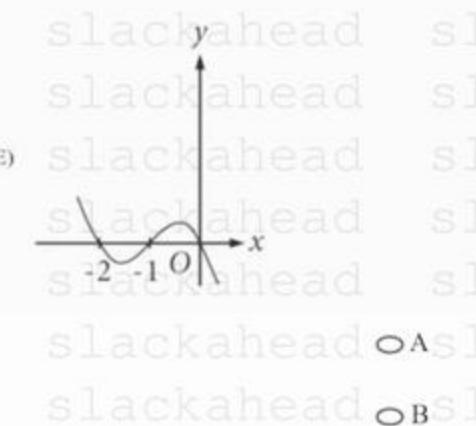
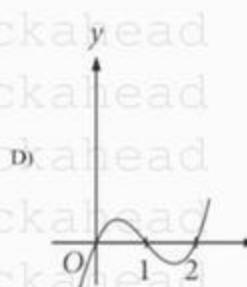
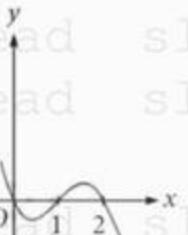
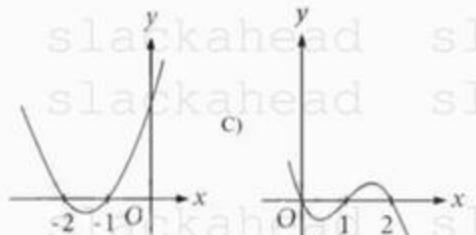
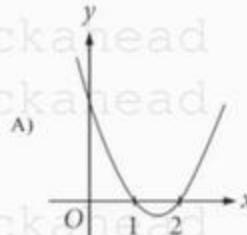
slackahead



3.5.4 Solving higher-order inequalities

1.

Of the following, which best represents the graph of the function $y = (x^2 - x)(x - 2)$?



2.

For which of the following can it be concluded that $(0, 1)$?

 A B C D E $x < 1$ $x^2 < 1$ $x^2 < x$ $x^3 < x^2$ $x^5 < x^3$



3.6.1 Definition of functions 1

slackahead

Quantity A
 c_k **Quantity B**
 $\frac{2k^2-1}{k+k}$

3.6.2 Newly Defined Functions

slackahead

slackaheads

slackahead

Quantity A $c@3$, where $c > 3$ **Quantity B**

3



3.6.3 Graphs of functions

1.

The line with equation $y=3x-2$ will be translated 4 units to the right and 5 units up in the xy -plane. Which of the following is the equation of the resulting line?

$y=3x+15$

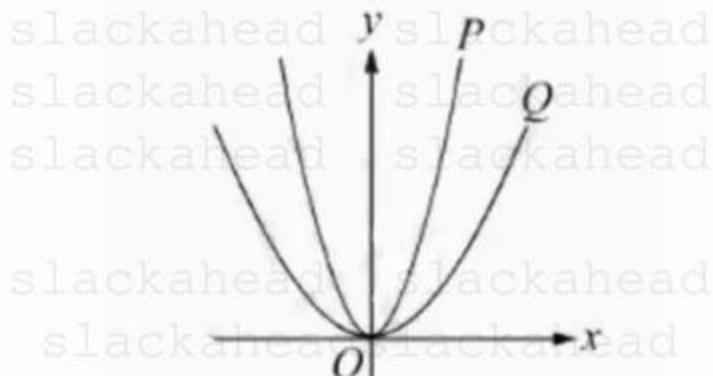
$y=3x+5$

$y=3x-9$

$y=3x-13$

$y=3x-21$

2.



In the xy -plane, parabola P is the graph of $y = mx^2$, where m is a constant, and parabola Q is the graph of $y = kx^2$, where k is a constant.

Quantity A

m

Quantity B

k



3.7.1 Coordinate systems and equations of straight lines

1.

In the rectangular coordinate system, which of the following is an equation of the line passing through the points $(5, 0)$ and $(9, 2)$?

$$\textcircled{O} \quad y = \frac{1}{2}x - \frac{5}{2}$$

$$\textcircled{O} \quad y = \frac{1}{2}x +$$

$$\circ y = \frac{1}{2}x + 5$$

2.

In the xy-plane, the point $(3p, 5p-1)$ lies on the line with equation $y = -\frac{1}{2}x - \frac{5}{3}$. What is the value of p ?

Give your answer as a fraction.

2

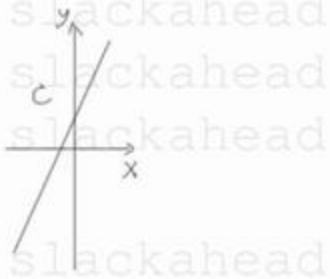
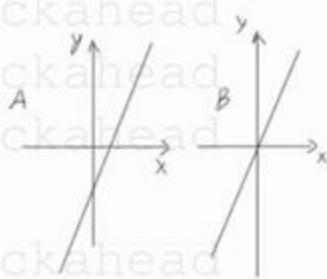
10



3.7.2 Slope

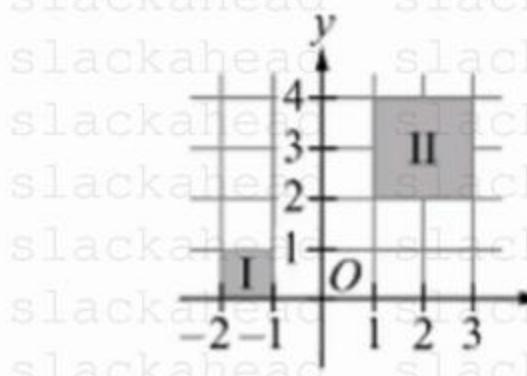
1. slackahead

Which of the following best represents the graph of the equation $y - 5x + 4 = 0$ in the xy -plane?



- 100

- OE



Two shaded square regions, including their edges, are shown above in the xy -plane and are labeled I and II, respectively. P is the set of all possible slopes of line segments ST, where point S is in region I and point T is in region II.

Quantity A

The greatest member of set P

Quantity_B

316



3.7.3 Intercept

slackahead

Quantity A

The x-intercept of line l

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

Quantity B

The x-intercept of line n

slackahead

Indicate all such statements.

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slackahead

$a+b < 0$

slackahead

$a-b < 0$

slackahead

$ab < 0$

slackahead



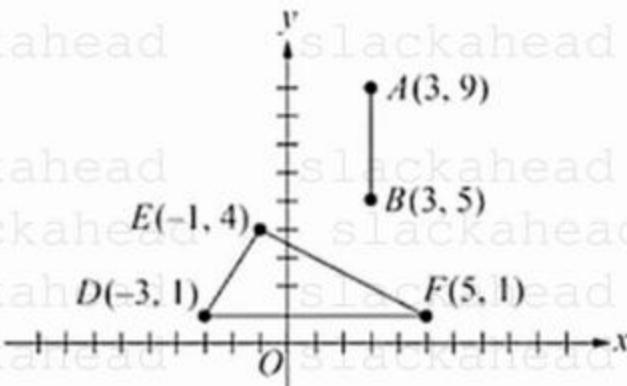
3.7.4 Two-point distance formula

1.

In the xy -plane, a triangle has vertices $(0, 3)$, $(b, 3)$, and $(0, 3b)$, where b is a constant. If the area of the triangle is 18, which of the following is a possible value of b ?

 -4 -3 2 3 6

2.



In the xy -plane shown, what is the maximum distance from an endpoint of line segment AB to a vertex of triangle DEF?



3.7.5 Midpoint coordinate formula

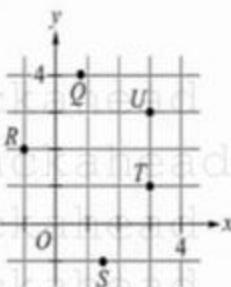
1.

In the xy-plane, line m passes through the point $(7, 7)$ and is perpendicular to the line $x+y=4$. The point (a, b) is on line m and is halfway between the point $(7, 7)$ and the line $x+y=4$. What is the value of $a+b$?

 8 9 10 11 12

3.7.6 Determining the relationship between a line and a point 1

1.



In the rectangular coordinate system shown, how many of the five points Q, R, S, T, and U have coordinates that satisfy the inequality $y > -x + 3$?

 One Two Three Four Five



2.

In the xy -plane, triangular region R is bounded by the lines $x = 0$, $y = 0$, and $4x + 3y = 60$. Which of the following points lie inside region R ?

Indicate all such points

 (2, 18) (5, 12) (10, 7) (12, 3) (15, 2)

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

3.7.7 Analytical equations for parabolas

slackahead
slackahead
1. slackahead

The function f is defined for all numbers x by $f(x) = 57x^2 - kx + 925$, where k is a constant, and $f(x) = f(-x)$ for all x .

slackahead

slackahead

slackahead

slackahead

slackahead

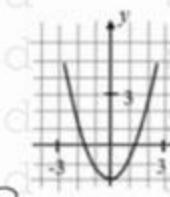
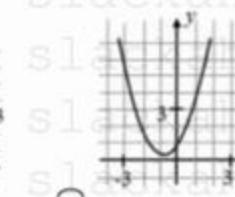
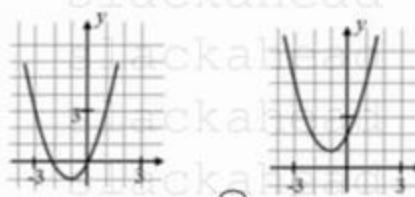
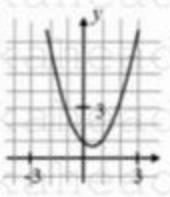
Quantity A

k

Quantity B

0

The functions f and g are defined for all numbers x by $f(x) = x^2$ and $g(x) = bx + 1$, where b is a constant and $0 < b < 2$. Which of the following could be the graph of $y = f(x) + g(x)$ in the xy -plane?





3.7.8 Analytical equations of circles

1.

In the xy -plane, a circle with radius 4 has its center at the point $(-1, 2)$. Which of the following is an equation of the circle?

- $(x - 1)^2 + (y + 2)^2 = 2$
 $(x - 1)^2 + (y + 2)^2 = 4$
 $(x - 1)^2 + (y + 2)^2 = 16$
 $(x + 1)^2 + (y - 2)^2 = 4$
 $(x + 1)^2 + (y - 2)^2 = 16$

2.

In the xy -plane, the circle with radius 50 and center $(0, 0)$ passes through which of the following points?

Indicate all such points.

- slackahead
 slackahead
 slackahead

- $(-30, 40)$
 $(0, -50)$
 $(25, 25)$
 $(14, 48)$
 $(70, -20)$

3.7.9 Linear & Circular Coordinate Geometric Programming 1

1.

x and y are real numbers and $x+y > 1$

Quantity A

$$x^2+y^2$$

Quantity B

1

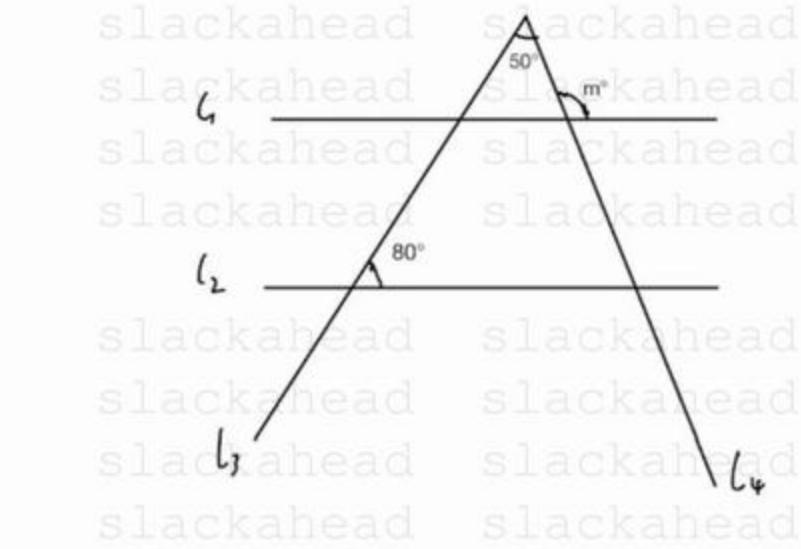


4.1.2 Alignment and Alternate Interior Angles

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2.

slackahead

**Quantity A**

m

Quantity B

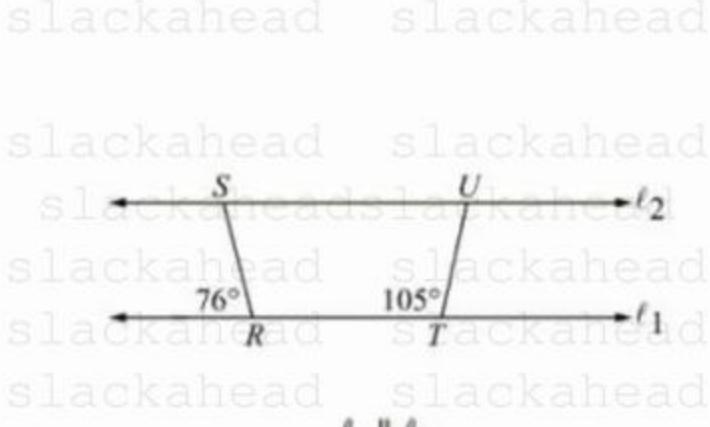
130

Quantity A

RS

Quantity B

TU





4.2.1 The value range of the interior angle of a polygon

Quantity A
The sum of interior angles of a square

Quantity B
The sum of any four interior angles of a pentagon

4.2.2 Polygon interior angle sum problem

Polygon P has n sides ($n > 4$).

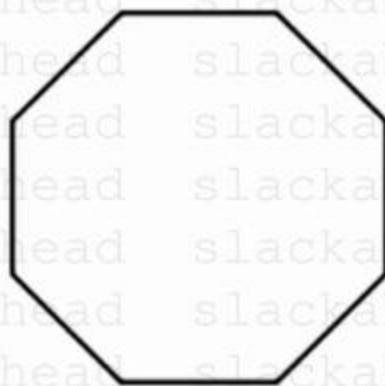
Quantity A

180 more than the sum of the degree measures of the interior angles of P

Quantity B

The sum of the degree measures of the interior angles of a polygon with $n+1$ sides

4.2.3 Diagonal number of polygons



The figure above is a regular octagon. A diagonal of an octagon is any line segment connecting two nonadjacent vertices.

Quantity A

The number of diagonals of the octagon that are parallel to at least one side of the octagon

Quantity B

The number of diagonals of the octagon that are not parallel to any side of the octagon



A circle is inscribed in a regular octagon. If the perimeter of the octagon is 16, what is the circumference of the circle?

- slackahead
- slackahead
- slackahead
- slackahead $2\sqrt{2}\pi$
- slackahead $(2 + \sqrt{2})\pi$
- slackahead $3\sqrt{2}\pi$
- slackahead $(2 + 2\sqrt{2})\pi$

- slackahead $4\sqrt{2}\pi$
- slackahead
- slackahead
- slackahead
- slackahead
- slackahead
- slackahead

4.2.5 Similar Polygons

1.

Pentagon A and B are similar pentagons. Each side of pentagon B is half of the corresponding side of pentagon A.

Quantity A
 $\frac{1}{3}$ times the area of pentagon A

Quantity B
Area of pentagon B

- slackahead \textcircled{O} Quantity A is greater.

- slackahead \textcircled{O} Quantity B is greater.

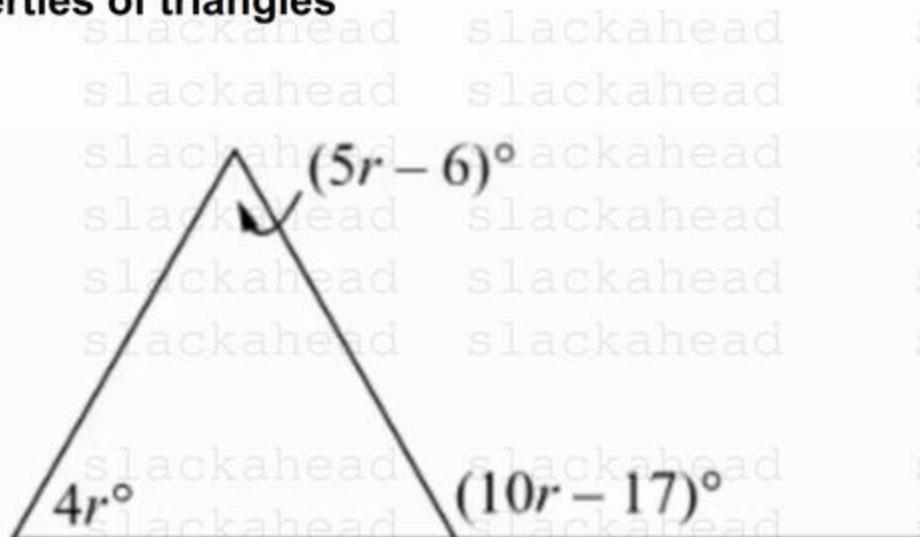
- slackahead \textcircled{O} The two quantities are equal.

- slackahead \textcircled{O} The relationship cannot be determined from the information given.



4.3.1 Basic properties of triangles

slackahead



Quantity A

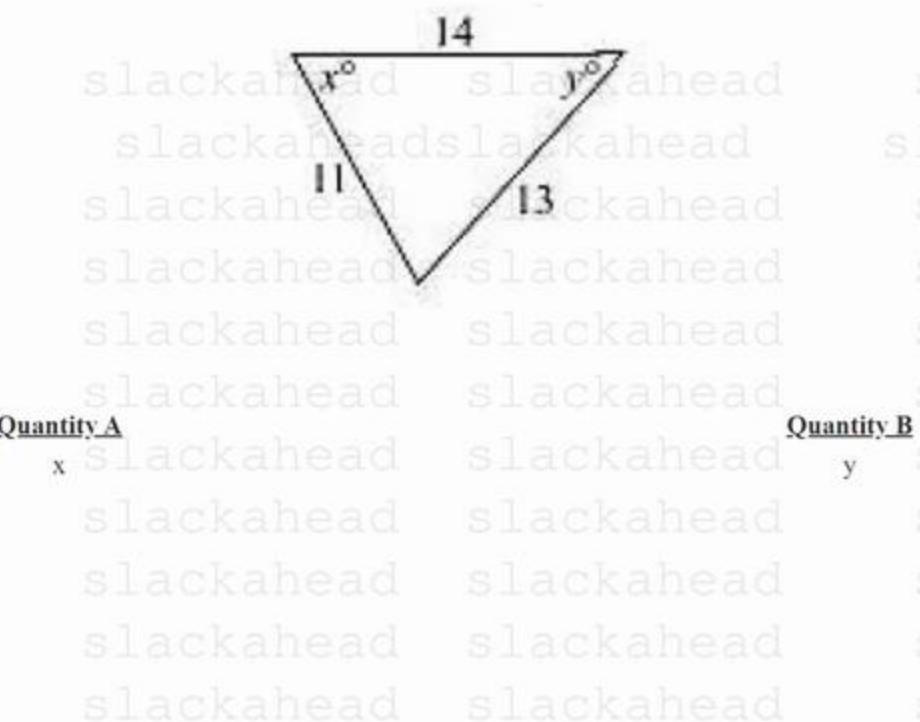
$$r$$

slackahead
slackahead
slackahead

Quantity B

$$12$$

slackahead
slackahead
slackahead



Quantity A

$$x$$

slackahead
slackahead
slackahead
slackahead
slackahead

Quantity B

$$y$$

slackahead
slackahead
slackahead
slackahead
slackahead



4.3.2 Trilateral relations of a triangle

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slackahead

slackahead

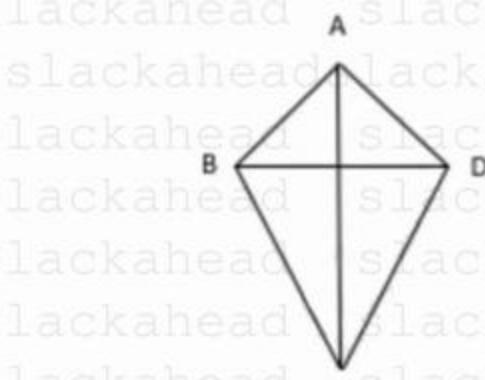
slackahead

slackahead

Indicate all such values.

slackahead

- 21
 25
 28
 36
 43
 47

**Quantity A**

The perimeter of ABCD

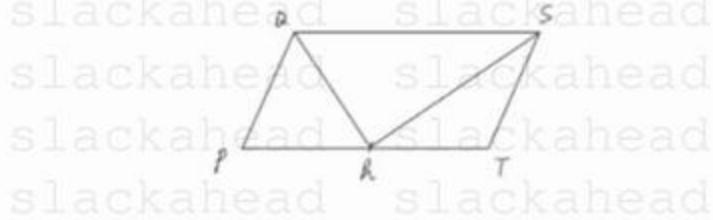
Quantity B

The sum of the lengths of diagonals AC and BD



4.3.3 Perimeter and area of a triangle

1.



PQST is a parallelogram and R is the midpoint of side PT.

Quantity A

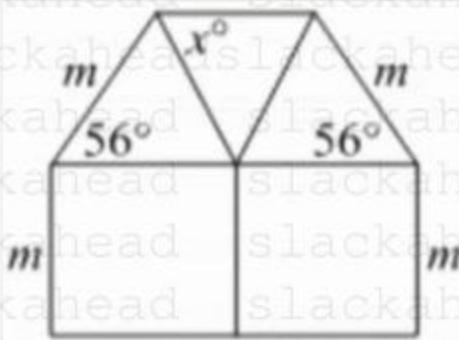
The area of triangular region PQR

Quantity B

The area of triangular region RST

4.3.4 Equilateral and isosceles triangles

1.



The interior of the figure shown is divided into two squares and three triangles.

Quantity A

The measure of angle x

Quantity_B

56



2.

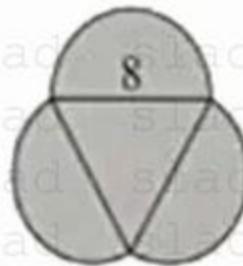
Quantity A
The area of isosceles triangle A

The leg of isosceles triangle A is 8, while the leg of isosceles triangle B is 10.

Quantity B
The area of isosceles triangle B

3.

Quantity A
The combined area of the 4 shaded regions



a semicircle.

Quantity B
96

4.

There is an isosceles triangle and an equilateral triangle with the same height.

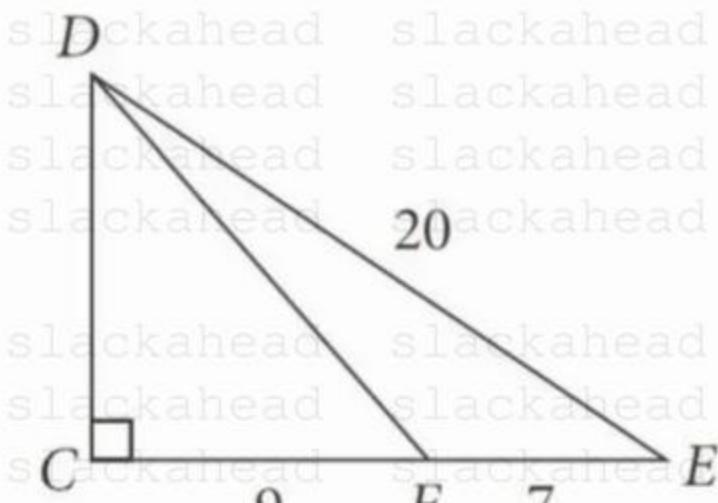
Quantity A
The area of the isosceles triangle

Quantity B
The area of the equilateral triangle



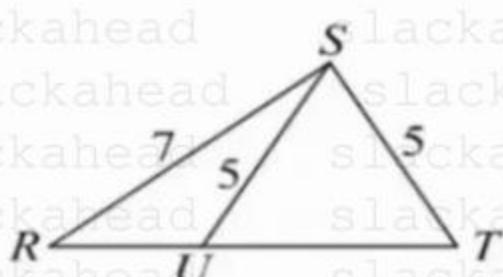
4.3.5 Right triangles and the Pythagorean theorem

1.

**Quantity A**The length of line segment DF **Quantity B**

12

2.

In the figure shown, what is the product of the lengths of line segments RU and RT ?

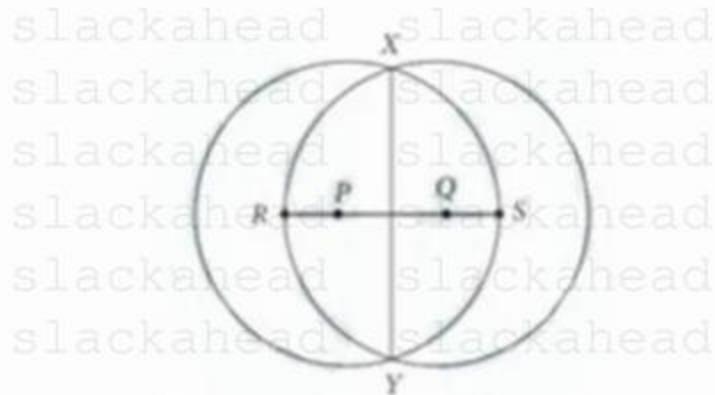
- $2\sqrt{6}$
- $\sqrt{35}$
- $\frac{35}{2}$

- 24

- 35



3.



The figure shows two congruent circles with centers P and Q. If $RP = QS = 1$ and $XY = 8$,

Quantity A

the distance between centers P and Q

Quantity_B

4

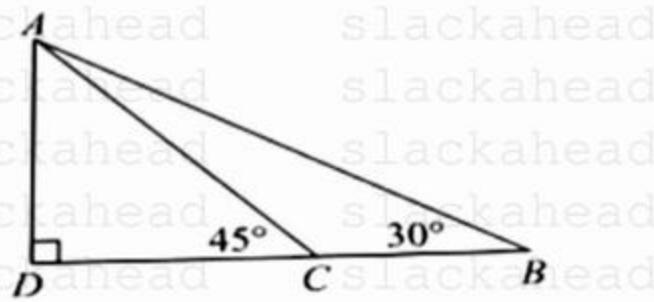
4. Alice and Eddie are between the end A and B. The line AB extends from Eddie's eye level to the ground directly below him. The distance from the ground to the eye level is 110 meters and B is the following statement:

Alice and Eddie are each flying a kite on level ground. A taut string extends from Alice's hand to her kite so that the length of the string between the end A in her hand and the end X attached to her kite is 105 meters and A is 2 meters above the ground. A taut string extends from Eddie's hand to his kite so that the length of the string between the end B in his hand and the end Y attached to his kite is 110 meters and B is 1 meter above the ground. At a certain moment, when X and Y are directly above each other, the point on the ground directly below X and Y is 5 meters and 45 meters, respectively, from the points on the ground directly below A and B. Which of the following statements is true about the relative heights of X and Y above the ground at that moment?

- X is approximately 5 meters higher than Y
- X is approximately 10 meters higher than Y
- The distance between X and Y is less than 1 meter
- Y is approximately 5 meters higher than X
- Y is approximately 10 meters higher than X



5.



If $DC=x$ in the figure above, what is the perimeter of triangle ABD in terms of x ?

$2x + \sqrt{3}x$

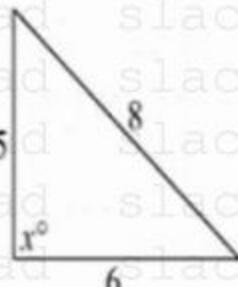
$2x + \sqrt{2}x$

$3x + \sqrt{3}x$

$3x + \sqrt{5}x$

$4x + \sqrt{3}x$

4.3.6 Determination of obtuse acute triangles

**Quantity A**

x

Quantity B

90



2.

The lengths of the sides of triangle RST are 3, 4, and y . Which of the following inequalities specifies those values of y for which each angle measure of triangle RST is less than 90° ?

$0 < y < 5$

$0 \sqrt{7} < y < 5$

$0 \sqrt{7} < y < 6$

$0 < y < 6$

$0 < y < 2\sqrt{5}$

4.3.7 The circumcenter of a triangle

P, Q, and R are three points in a plane that are not all on the same line. Which of the following describes the set of all points in the plane that are equally distant from points P, Q and R?

 A circle A point A triangle Two lines Three lines

Two line segments of equal length bisect each other.

2.

Quantity A

The number of circles that pass through at least three
of the four endpoints

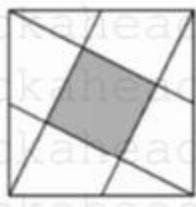
Quantity B

2



4.3.8 Congruent and similar triangles

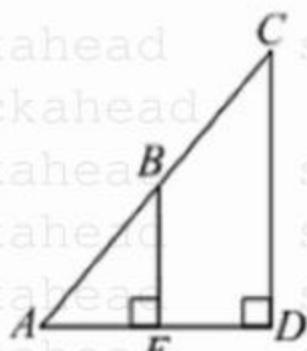
1.



The figure shows a square in which each of four interior line segments connects the midpoint of a side to a vertex of the square. The area of the shaded regions what fraction of the area of the square?

 $\frac{1}{6}$ $\frac{1}{5}$ $\frac{\sqrt{5}}{10}$ $\frac{1}{4}$ $\frac{\sqrt{3}}{6}$

2.

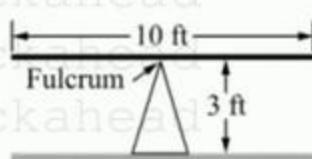


In the figure above, if $AC = 15$, $BC = 5$, and $AE = 5$, what is the value of ED ?

 10 $7\frac{1}{2}$ 5 $3\frac{1}{3}$ $2\frac{1}{2}$



3



A 10-foot long board is parallel to level ground, and the fulcrum supporting it is at the board's midpoint, as shown in the figure above.

If the board is tipped, with the fulcrum remaining at the board's midpoint, so that the board's left end just touches the ground, which of the following is closest to the number of feet that the right end of the board is above the ground?

4.4.1 Parallelograms

Quantity A

The area of the region enclosed by ABCD

slackahead slackahead
slackaheads slackahead
slackahead slackahead

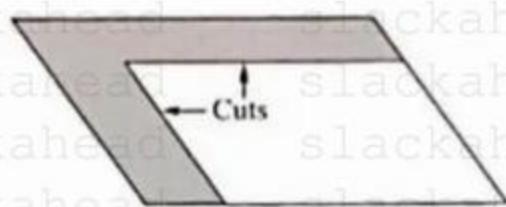
Parallelogram ABCD has adjacent sides of length 10 and 16.

Quantity_B

155



2.

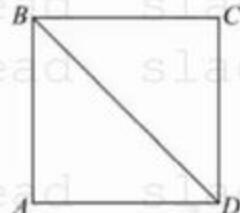


A thin metal plate in the shape of a parallelogram has an area of 80 square inches and is cut into two pieces using two cuts. Each cut is parallel to a side of the plate, as shown, and the ratio of the length of each cut to the length of the side of the plate to which the cut is parallel is 3 to 4. What is the area, in square inches, of the piece of the plate represented by the shaded region?



4.4.2 Rectangles and squares

1.



ABCD is a square, as shown above.

Quantity A
$$\frac{BC+CD}{BD}$$

Quantity B

2

On each side of a parade route, spectators occupy a sidewalk that is 10 feet wide and 1.5 miles long. The parade organizers estimate that the average amount of sidewalk space occupied per spectator is 6 square feet. Based on this estimate, which of the following is closest to the total number of spectators occupying the two sidewalks? (1 mile = 5,280 feet)

9,000

14,000

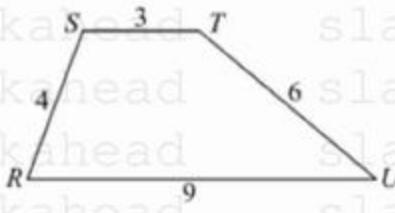
18,000

22,000

26,000



4.4.4 Trapezoids

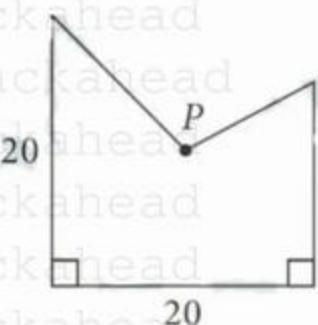


The parallel sides (bases) of trapezoid RSTU have lengths 3 and 9, and the nonparallel sides have lengths 4 and 6, as shown in the figure. Line segment AB (not shown) is parallel to the two bases of RSTU with point A on side RS and point B on side TU. If AB divides the trapezoid into two trapezoids having equal perimeters, what is the sum of the lengths of the nonparallel sides of trapezoid

- RABU?

- slackahead ○ 2.0
slackahead ○ 2.5
slackahead ○ 3.0
slackahead ○ 4.0
slackahead ○ 5.0

- 2



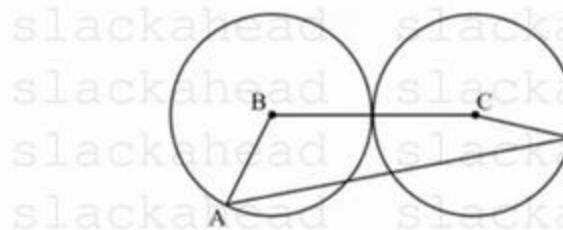
The figure above represents the surface of a wall with an irregular shape, where all measurements are in meters and point P is 10 meters from the bottom edge and 10 meters from the left edge. The surface is to be painted, and one bucket of paint will cover 170 square meters of the surface. If the bucket of paint will cover the part of the surface from the left edge to a vertical line that is x meters from the left edge, which of the following is true?

- ⓐ $8 < x < 9$
 - ⓑ $9 < x < 10$
 - ⓒ $10 < x < 11$
 - ⓔ $11 < x < 12$
 - ⓕ $12 < x < 13$



4.5.1 Chord length of a circle

1.



The two circles have centers at B and C, respectively, and are mutually tangent. Each circle has radius r.

2.

Quantity A

The perimeter of quadrilateral ABCD

Quantity B

8r



The two circles shown have the same circumference and are tangent to each other at point S. Point R (not shown) is on one of the circles, and point T (not shown) is on the other circle.

Quantity A

The circumference of either circle

Quantity B

The length of line segment RT



4.5.2 Circumference and area of a circle

1.

The circumference of a certain circular region is y .

Quantity A

The area of the circular region

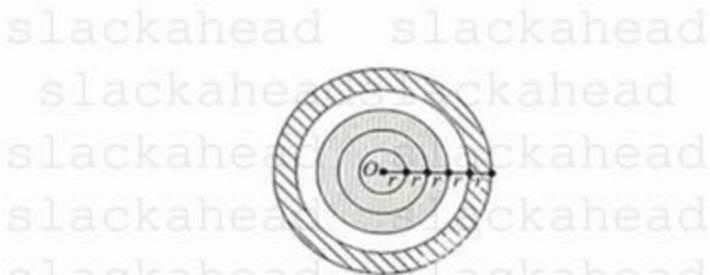
Quantity B

$$\frac{y^2}{4}$$

2.

A stone was dropped into a still pond and produced concentric circular ripples on the surface of the water. The radius of the outermost ripple increased at a constant rate of x feet per second. If the area of the circular region enclosed by the outermost ripple was 400π square feet 10 seconds after the stone hit the water, what is the value of x ?

3.



The center of each of the five circles is point O. The radii of the five circles, from smallest to largest, are r , $2r$, $3r$, $4r$, and $5r$, respectively.

Quantity A

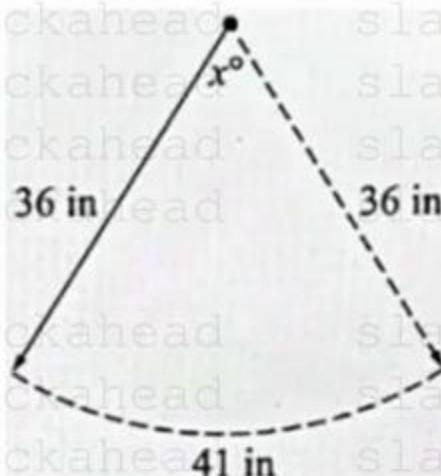
The area of the shaded region

Quantity B

The area of the striped region



4.5.3 Arc Length and Sector Area



A pendulum 36 inches long swings through an angle of x degrees, and its pointed end travels through a distance of 41 inches before swinging back again, as shown in the figure. Which of the following is closest to the value of x ?

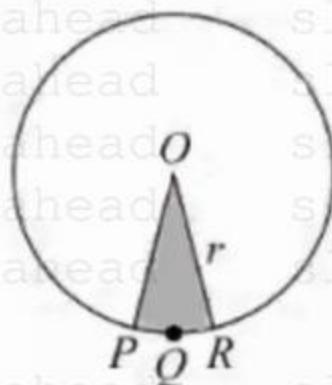
- 60
- 65
- 70

- 75
- 80

- 85



2.



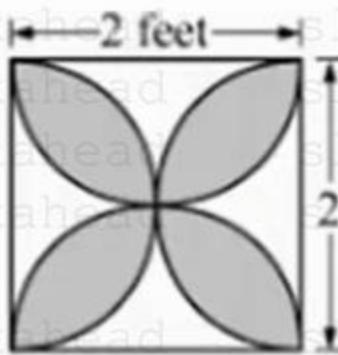
In the figure, point O is the center of the circle of radius r . If the length of arc PQR is $\frac{\pi}{2}$, and the area of the shaded region is $\frac{5\pi}{4}$, what is the value of r ?

- $\frac{5}{4}$
- $\frac{3}{2}$
- 3
- 5
- 10



4.5.4 The area of irregular shapes related to circles

1.



The figure shows the design of a mosaic tile in which the four sides of the square are the diameters of four intersecting semicircles.

Small blue stones are to be placed in the shaded regions and will cover 95 percent of the area of these regions. If each side of the square has length 2 feet, approximately how many square feet of the tile will be covered by the blue stones?

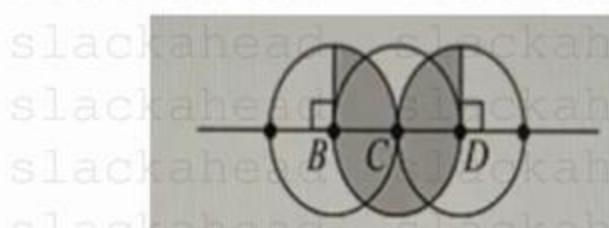
O 0.9

O 1.5

O 2.2

O 2.9

O 3.2



Three circles with radii of the same length have centers B, C, and D, respectively. The circles with centers B and D are tangent to each other at C.

Quantity A

The area of the shaded region

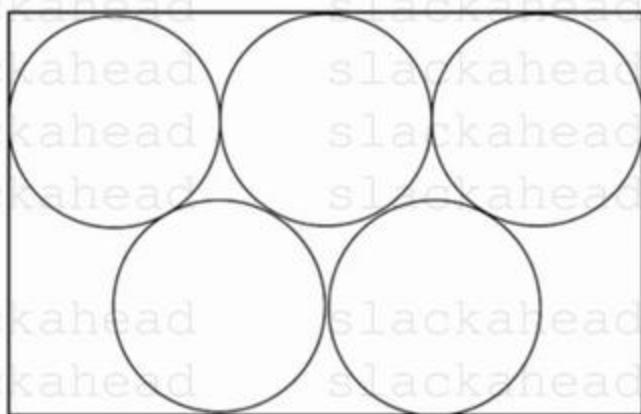
Quantity B

The sum of the areas of the unshaded regions inside the circle



4.5.5 Polycircle graphics problems

1



The figure above shows a rectangle and five circles. Each circle is tangent to the other circles and to the sides of the rectangle that it touches. If the diameter of each circle is 4, what is the area of the rectangle?

$\circ 24+12\sqrt{2}$

$$\textcircled{O} 24+12\sqrt{3}$$

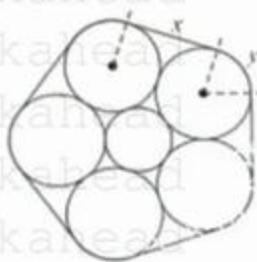
$$\textcircled{O} \quad 48 + 24\sqrt{2}$$

$$= 48 + 24\sqrt{3}$$

Q96



2

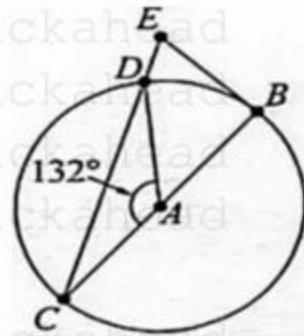


The figure above shows five congruent circles each with radius 2 such that each of the five circles is tangent to two other congruent circles and to a smaller inner circle. The perimeter of the figure is composed of 5 line segments of length x and 5 circular arcs of length y . What is the perimeter of the figure?



4.5.6 Central Angle and Circumferential Angle

- ## 1. blackhead



In the figure shown, A is the center of the circle, and line segments EB is tangent to the circle at point B. What is the degree measure of angle E?

- 48°
 - 52°
 - 55°
 - 61°

slackahead $\odot 66^\circ$ slackahead

slackahead  N slackahead

slackahead x slackahead

slackahead slackahead
M S

MINO is inscribed in semi-circle MINO with radius 1.

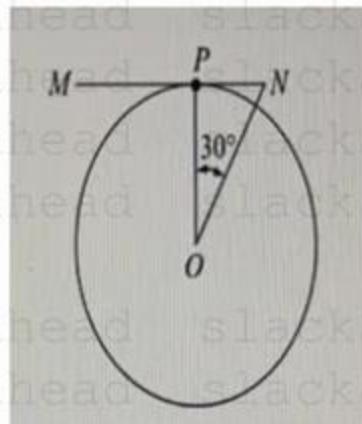
Quantity A

Quantity B



4.5.7 Circles and tangents

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead



In the figure, MN is tangent to the circle at point P, and O is the center of the circle, and the length of PN is $2\sqrt{3}$.

Quantity A

The circumference of the circle

Quantity B

36

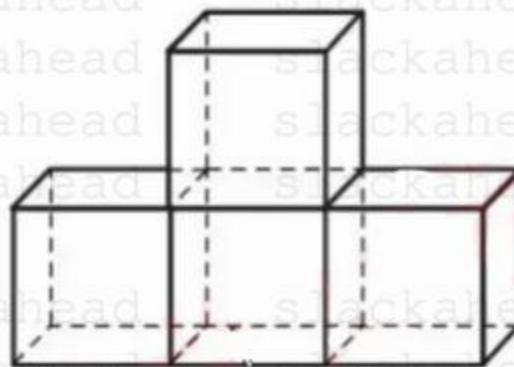
2.



Point A and point B are the centers of two circles, and their radius are 10 and 3 respectively. Point C and point D are the points of tangency of the two circles and a horizontal line. Point E and point F are the intersections between the two circles and line AB. If $EF=12$, what is the length of CD?



4.6.1 Cuboids and Cubes



The solid shown above is composed of four identical solid cubes, each with sides of length 2. What is the surface area of the solid?

64

72

76

80

84

The inside of a rectangular aquarium has an inner base that measures 8 inches by 10 inches, and has an inner height of 10 inches. The rectangular base of the aquarium is level, and the aquarium is filled with water so that the water level is 6 inches higher than the base.

After a solid piece of steel is completely submerged in the water, the water level is 7 inches higher than the base.

Quantity A

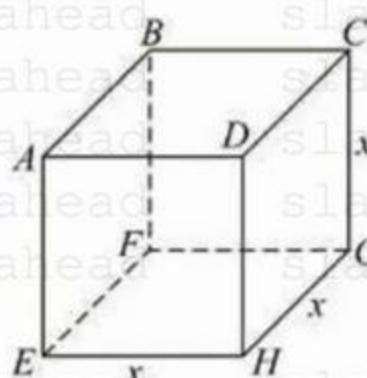
The volume of the piece of steel

Quantity B

100 cubic inches



3.

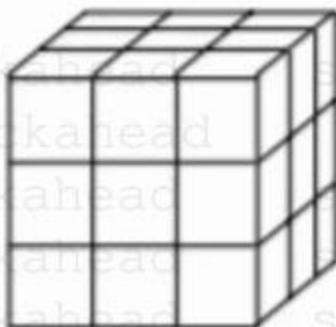


The cube shown above has edges of length x , where x is an integer. The length of diagonal AG (not shown) is 10.39, to the nearest 0.01. What is the value of the integer x ?

slackahead
 $x = \underline{\hspace{2cm}}$
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

4.



If 20 red cubes and 7 white cubes, all of equal size, are fitted together to form one large cube, as shown above, what is the greatest fraction of the surface area of the large cube that could be red?

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

- $\frac{8}{9}$
- $\frac{47}{54}$
- $\frac{23}{27}$
- $\frac{5}{6}$
- $\frac{20}{27}$



4.6.2 Cylinders

slackahead

slackahead

1.

slackahead slackahead slackahead

slackahead slackahead slackahead

The volume of a cylinder is 54π and the height is 6. What is the circumference of the bottom of the cylinder?

slackahead slackahead slackahead

slackahead slackahead slackahead

slackahead $0^{\circ}\pi$ slackahead

$0^{\circ}2\pi$

slackahead $0^{\circ}4\pi$ slackahead

slackahead $0^{\circ}6\pi$ slackahead

slackahead $0^{\circ}8\pi$ slackahead

slackahead

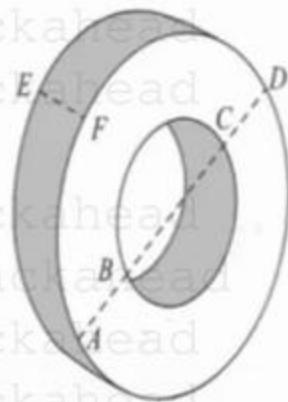
slackahead

slackahead

slackahead

slackahead

2.



slackahead slackahead slackahead

The figure shows a wooden toy wheel made by removing a smaller right circular cylinder from a larger right circular cylinder so that

the cylinders are centered around the same axis. Line segments BC and AD are diameters of the smaller and larger cylinders,

respectively, and line segment EF represents the width of both cylinders. The lengths, in centimeters, of BC, AD, and EF are 3, 7, and

2, respectively. Approximately what is the volume, in cubic centimeters, of the wood contained in the finished wheel?

slackahead $0^{\circ}14$ slackahead

slackahead $0^{\circ}20$ slackahead

slackahead $0^{\circ}31$ slackahead

slackahead $0^{\circ}63$ slackahead



3.

slackahead slackahead slackahead slackahead

There are two right circular cylinder oil drums. In the first cylinder, the base area is 4π and the oil height is 5, while in the second cylinder, the base area is 10π , and the oil height is 6. Mark gradually pours oil from the second cylinder into the first one, so that the oil height in both cylinders will become the same. What will be the oil height at last? Give your answer as a fraction.

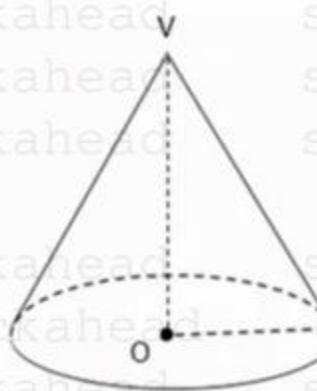
slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead slackahead slackahead

4.6.3 Cones

1.



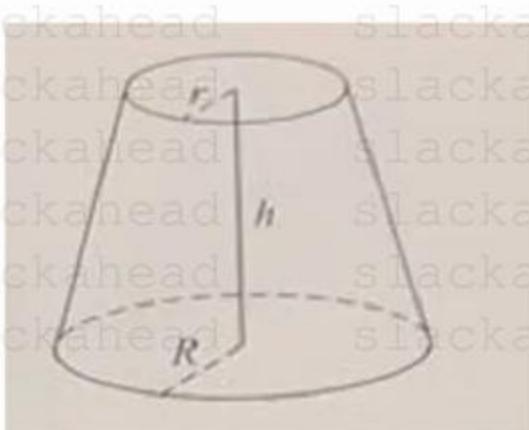
In the above circular cone, point V is its apex, point P is on the circle of its base, and point O is the center of its base. The length of segment VP is 2 and the measure of angle OVP is 30° . Which of the following is the volume of this solid?

slackahead slackahead slackahead slackahead slackahead slackahead

slackahead slackahead slackahead $\textcircled{O} \pi$ slackahead slackahead slackahead $\textcircled{O} \frac{\sqrt{3}}{3} \pi$ slackahead slackahead $\textcircled{O} 2\pi$ $\textcircled{O} 3\pi$



2.



The volume V of the frustum of a right circular cone is given by $V = \frac{\pi h}{3}(R^2 + Rr + r^2)$, where h is the height of the frustum, R is the radius of its lower base, and r is the radius of its upper base, as shown. If the volume of the frustum of a right circular cone is 148π , its height is 12, and the radius of its upper base is 3, what is the radius of the lower base of the frustum?

- 04
- 05
- 06
- 07
- 08



5.1.1 Table

slackahead
slackahead
1.

Nutrition Information on a Bag of Trail Mix^a

Serving Size: 28 grams

Servings per Bag: 2.5^a

Amount per Serving ^a	Calories per Serving ^a
Total fat ^a	7 grams ^a
Saturated fat ^a	2 grams ^a
Total carbohydrates ^a	15 grams ^a
Dietary fiber ^a	2 grams ^a
Sugars ^a	5 grams ^a
Protein ^a	4 grams ^a
Cholesterol ^a	0 milligrams ^a
Sodium ^a	5 milligrams ^a
Total Calories ^a	
Calories from fat ^a	
Calories per Gram ^a	
Calories per gram of fat ^a	9 ^a
Calories per gram of carbohydrates ^a	4 ^a
Calories per gram of protein ^a	4 ^a

The total number of calories from carbohydrates in a single serving of Trail Mix is approximately what percent of the total number of calories in the serving?

○ 10%

○ 25%

○ 30%

○ 45%

○ 60%



2.

Nutrition Information on a Bag of Trail Mix

Serving Size: 28 grams

Servings per Bag: 2.5

Amount per Serving	Calories per Serving
Total fat ¹	7 grams ²
Saturated fat ¹	2 grams ²
Total carbohydrates ¹	15 grams ²
Dietary fiber ¹	2 grams ²
Sugars ¹	5 grams ²
Protein ¹	4 grams ²
Cholesterol ¹	0 milligrams ²
Sodium ¹	5 milligrams ²
Calories per Gram	
Calories per gram of fat ¹	9 ²
Calories per gram of carbohydrates ¹	4 ²
Calories per gram of protein ¹	4 ²

A certain candy bar contains a total of 28 grams of fat. The total number of grams of fat in the candy bar is what percent greater than the total number of grams of fat in one bag of Trail Mix?

- 18%
- 25%
- 60%
- 63%
- 72%



3.

Nutrition Information on a Bag of Trail Mix²

Serving Size: 28 grams

Servings per Bag: 2.5²

Amount per Serving ²	Calories per Serving ²
Total fat ²	7 grams ²
Saturated fat ²	2 grams ²
Total carbohydrates ²	15 grams ²
Dietary fiber ²	2 grams ²
Sugars ²	5 grams ²
Protein ²	4 grams ²
Cholesterol ²	0 milligrams ²
Sodium ²	5 milligrams ²
Calories per Gram²	
Calories per gram of fat ² 9 ²	
Calories per gram of carbohydrates ² 4 ²	
Calories per gram of protein ² 4 ²	

Which of the following expressions gives the number of grams of Trail Mix that contain N grams of saturated fat?

$\frac{9N}{139}$

$\frac{N}{14}$

$\frac{139N}{9}$

$14N$

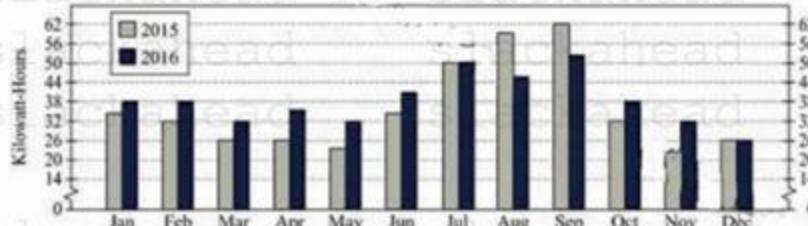
$9N$



5.1.2 Bar graphs

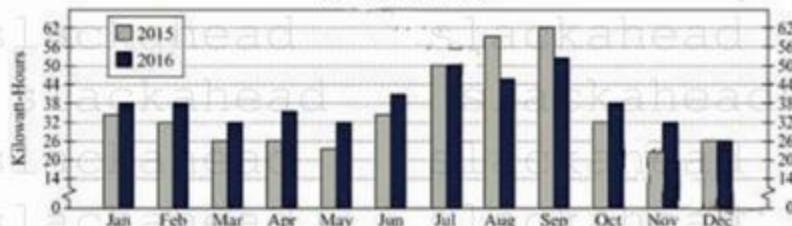
1.

Average* Daily Electric Use by Household X for 2015 and 2016 by Month (in kilowatt-hours)



2.

Average* Daily Electric Use by Household X for 2015 and 2016 by Month (in kilowatt-hours)



If the range of the average daily electric use for the months from January to June in 2015 was x kilowatt-hours less than that for the months from July to December in 2015 and if the range of the average daily electric use for the months from January to June in 2016 was y kilowatt-hours less than that for the months from July to December in 2016, approximately what is the value of $x-y$?

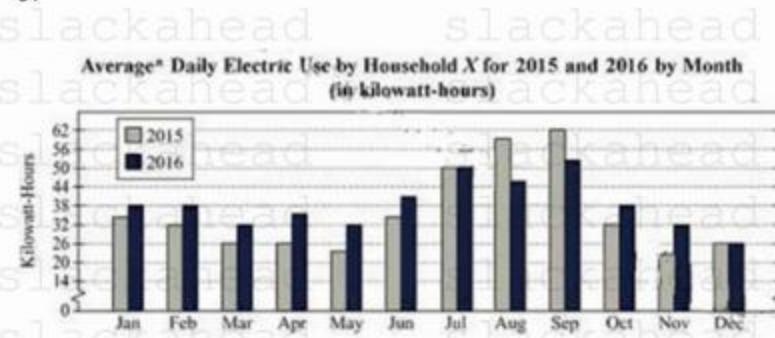
- 1
- 11
- 19
- 28
- 38

The total electric use, in kilowatt-hours, for the 31 days in March, the 30 days in April, and the 31 days in May was approximately how much greater for 2016 than for 2015?

- 30
- 90
- 480
- 600
- 730



3.

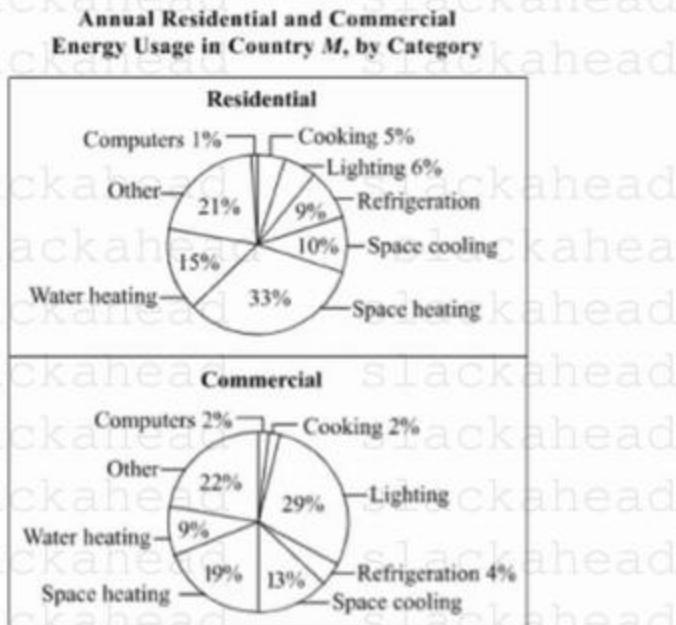


What is the ratio of the number of months for which the percent increase from 2015 to 2016 in the average daily electric use was greater than 28 percent to the number of months for which the percent increase from 2015 to 2016 in the average daily electric use was greater than 10 percent?

Give your answer as a fraction.

5.1.3 Pie Chart

1.



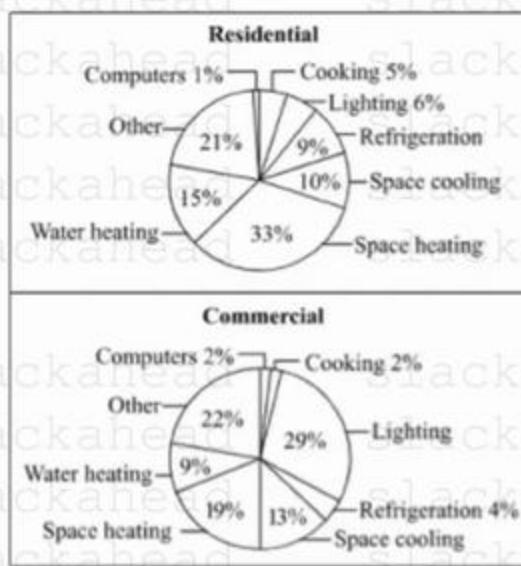
If the annual commercial energy usage for lighting is w units of energy, which of the following is closest to the annual commercial energy usage for refrigeration, in the same units of energy?

- 0.03w
- 0.14w
- 0.26w
- 0.35w
- 0.42w

2.



Annual Residential and Commercial Energy Usage in Country M, by Category



The ratio of the total annual residential energy usage to the total annual commercial energy usage is x to y . Which of the following represents the fraction of the total annual energy usage, both residential and commercial, that is for lighting?

$\frac{x+y}{6x+29y}$

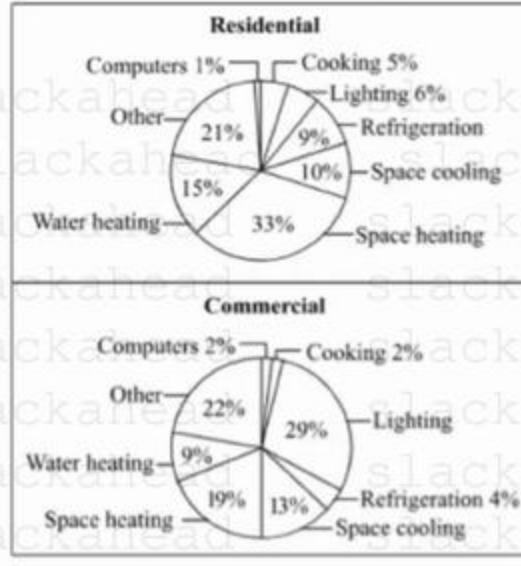
$\frac{x+y}{(100)(6x+29y)}$

$\frac{6x+29y}{(35)(x+y)}$

$\frac{6x+29y}{(100)(x+y)}$

$\frac{(100)(6x+29y)}{x+y}$

Annual Residential and Commercial Energy Usage in Country M, by Category



The annual commercial energy usage for space cooling is approximately what percent less than the annual commercial energy usage for space heating?

6%

22%

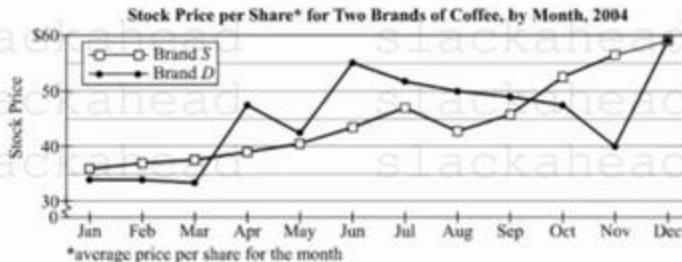
32%

39%

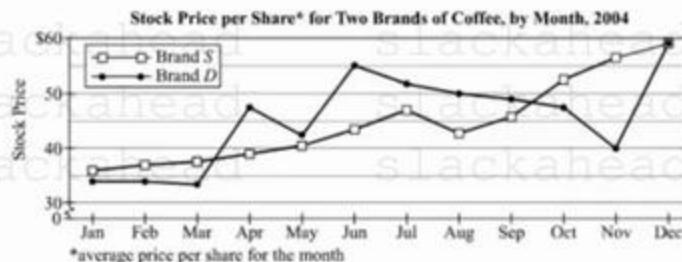
46%

5.1.4 Line Chart

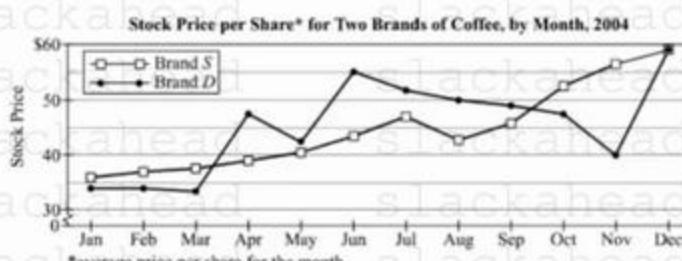
1.



2.



3.



slackahead

slackahead

slackahead

slackahead

By approximately what percent did the stock price per share of Brand S coffee increase from January to December?

25%

40%

65%

150%

250%

From the graph, Joe read the stock prices for three consecutive months for Brand D coffee. Which of the following is closest to the maximum possible range of the three stock prices that Joe read?

\$12

\$15

\$19

\$22

\$25

For each of the 5 months July through November, the stock price per share of Brand D coffee decreased from the price for the preceding month. Which of the following is closest to the average (arithmetic mean) of the 5 decreases in price per share?

\$1

\$2

\$3

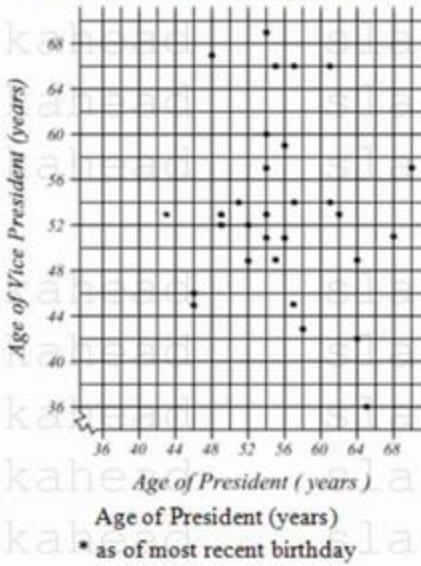
\$4

\$5



3.

Age* of Presidents and Corresponding Vice Presidents of 30 Organizations

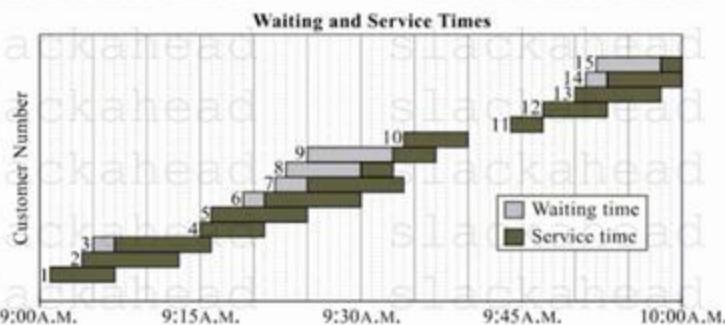


* as of most recent birthday

5.1.6 Other chart questions

1.

Each of the 15 customers who arrived at a customer service desk between 9 AM and 10 AM was served in order of arrival by one of the two customer service representatives. Each representative served one customer at a time and finished with that customer before serving any other customers. The graph shows the waiting and service times, recorded to the nearest minute, for customers numbered 1 to 15.



For how many of the organizations does the age of the president exceed the age of the corresponding vice president by 15 years?

None

One

Two

Three

Four

Five

Six

Seven

Eight

Nine

Ten

Eleven

Twelve

Thirteen

Fourteen

Fifteen

Sixteen

Seventeen

Eighteen

Nineteen

Twenty

Twenty-one

Twenty-two

Twenty-three

Twenty-four

Twenty-five

Twenty-six

Twenty-seven

Twenty-eight

Twenty-nine

Thirty

Thirty-one

Thirty-two

Thirty-three

Thirty-four

Thirty-five

Thirty-six

Thirty-seven

Thirty-eight

Thirty-nine

Forty

Forty-one

Forty-two

Forty-three

Forty-four

Forty-five

Forty-six

Forty-seven

Forty-eight

Forty-nine

Fifty

Fifty-one

Fifty-two

Fifty-three

Fifty-four

Fifty-five

Fifty-six

Fifty-seven

Fifty-eight

Fifty-nine

Sixty

Sixty-one

Sixty-two

Sixty-three

Sixty-four

Sixty-five

Sixty-six

Sixty-seven

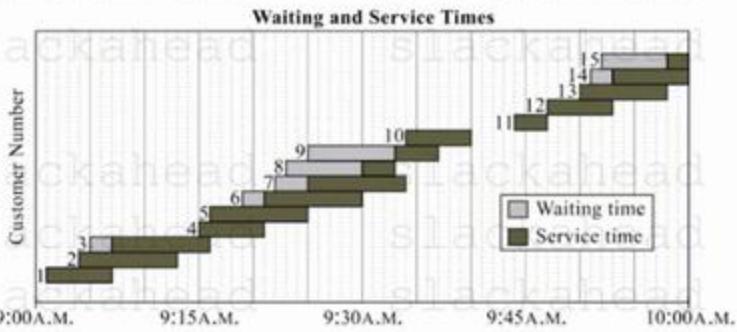
Sixty-eight

Sixty-nine



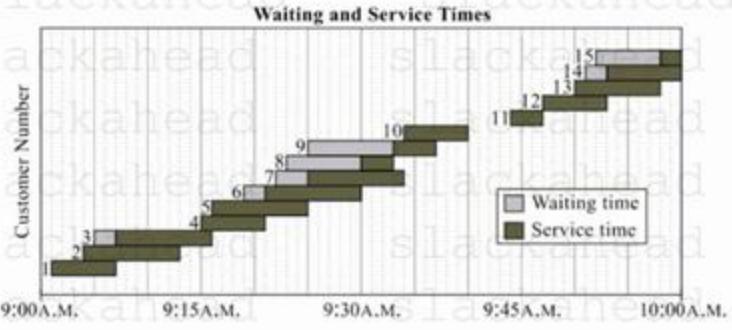
2.

Each of the 15 customers who arrived at a customer service desk between 9 AM and 10 AM was served in order of arrival by one of the two customer service representatives. Each representative served one customer at a time and finished with that customer before serving any other customers. The graph shows the waiting and service times, recorded to the nearest minute, for customers numbered 1 to 15.



3.

Each of the 15 customers who arrived at a customer service desk between 9 AM and 10 AM was served in order of arrival by one of the two customer service representatives. Each representative served one customer at a time and finished with that customer before serving any other customers. The graph shows the waiting and service times, recorded to the nearest minute, for customers numbered 1 to 15.



According to the recorded times, which customer had the greatest ratio of waiting time to service time?

Customer 6

Customer 7

Customer 8

Customer 9

Customer 15

What was the range of the recorded service times, in minutes, for the 15 customers?

4

6

7

9

14



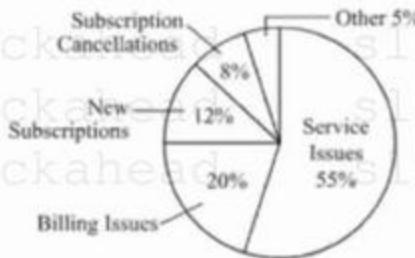
5.1.7 Comprehensive Chart Questions

1.

Customer Service Phone Calls Received by a Business During a Certain Week



Calls Received During the Week, by Type



If 50 percent of the calls received during the week about subscription cancellations were received on Friday, approximately what percent of the calls received on Friday were calls about subscription cancellations?

60%

40%

30%

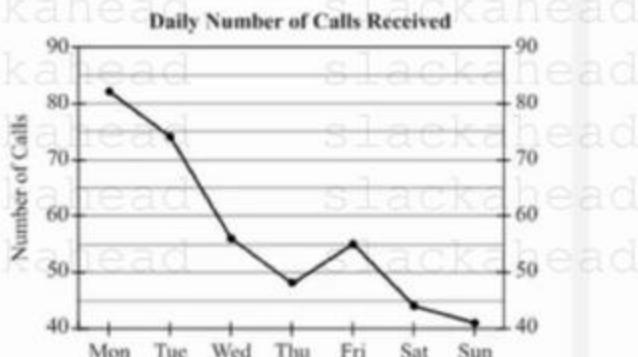
20%

4%

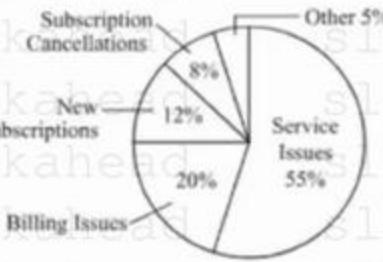


2.

Customer Service Phone Calls Received by a Business During a Certain Week

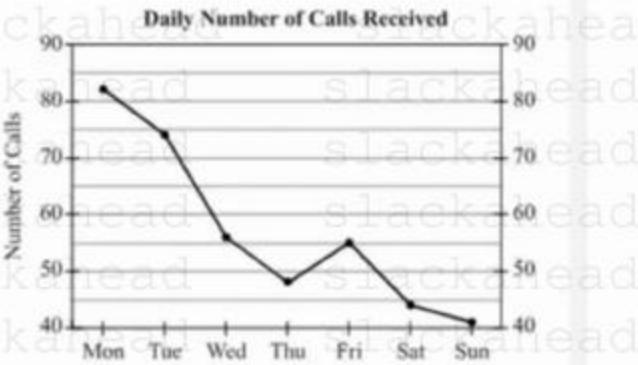


Calls Received During the Week, by Type

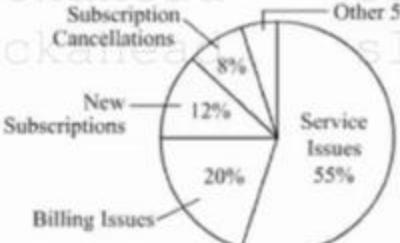


3.

Customer Service Phone Calls Received by a Business During a Certain Week



Calls Received During the Week, by Type



During the week shown, what is the least possible number of days on which the business could have received one or more calls about service issues?

- One
- Two
- Three
- Four
- Five

If a circle graph is to be drawn to show the distribution of the numbers of calls received per day for the week shown, what will be the degree measure of the central angle of the sector representing Thursday?

Give your answer to the nearest degree.

_____ degrees



5.2.1 Means

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

1.

Each digit of a 20-digit number is either a 1, 2, 3, 4, or 5. If the average (arithmetic mean) of 15 of the 20 digits of the number is 2.8 and if M is the average of all 20 digits of the number, then M must satisfy which of the following inequalities?

slackahead

1. $1.95 \leq M \leq 2.25$

2. $2.15 \leq M \leq 2.50$

3. $2.25 \leq M \leq 2.55$

4. $2.35 \leq M \leq 3.35$

5. $2.45 \leq M \leq 3.55$

2.

At a certain online bookstore, the price of each book is the same. The total price of a customer order is the sum of the prices of the books in the order plus a shipping fee that is constant regardless of the number of books purchased. Last year the average (arithmetic mean) number of books per customer order was 1.5, and the average of the total prices of the orders was \$10.50. Which of the following amounts could be the book price and the shipping fee last year?

Indicate all such amounts.

slackahead

slackahead

slackahead

slackahead

slackahead

slackaheads

slackahead

slackahead

A. \$4.00 per book and \$4.50 shipping fee

B. \$4.50 per book and \$3.50 shipping fee

C. \$5.00 per book and \$3.00 shipping fee

D. \$5.50 per book and \$2.25 shipping fee



3.

At the end of each business day, the owners of Stores X and Y calculate the total daily revenue received that day. For a five-business-day period, the average (arithmetic mean) total daily revenue was \$6,000 for Store X and \$5,000 for Store Y. Which of the following statements must be true?

Indicate all such statements.

- The total daily revenue of Store X was greater than that of Store Y for at least one of the five days.
- The total daily revenue of Store X was greater than that of Store Y for at least two of the five days.
- The greatest total daily revenue of Store X for the five days was greater than that of Store Y.

5.2.2 Median

1.

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Week 1	56	63	63	53	64	53	61
Week 2	57	58	58	59	57	56	58

The table above shows the predicted high temperatures, in degrees Fahrenheit, for two weeks in City X. Based on the information given, which of the following changes to the temperatures would cause a change in the median of the temperatures for the two-week period?

- Interchanging the temperatures for Wednesday of week 1 and Thursday of week 2
- Interchanging the temperatures for Wednesday of week 1 and Wednesday of week 2
- Changing the temperature for Wednesday of week 1 to be equal to the temperature for Wednesday of week 2
- Changing the temperature for Sunday of week 1 to be equal to the temperature for Tuesday of week 2
- Changing the temperature for Saturday of week 2 to be equal to the temperature for Friday of week 1



2.

Mechanic	A	B	C	D	E
Time (seconds)	15	20	25	16	x

The table above shows the times, in seconds, that it took each of 5 mechanics to perform a simple task. For the 5 times shown, if the median is greater than the average (arithmetic mean), which of the following could be the value of x ?

Indicate all such values.

 17 18 20 22 26

5.2.3 Median and Mean of Arithmetic Sequences

The median of the first 999 positive even integers

Quantity B

The median of the first 999 positive odd integers

5.2.4 Mode

List K consists of 9 positive integers. In list K, the range of the integers is 20, the mode of the integers is 3, and the median of the integers is 7.

Quantity A

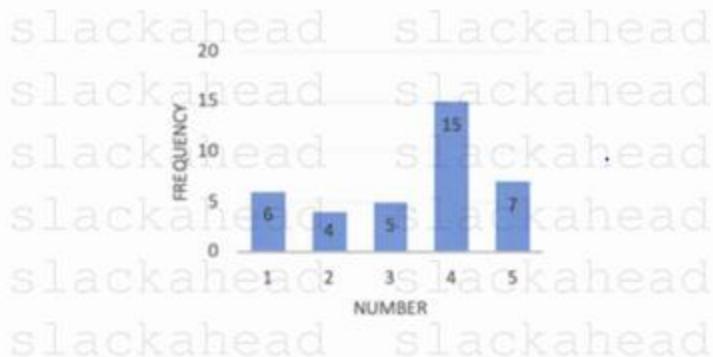
The average (arithmetic mean) of the integers in list K

Quantity B

13



2



Quantity A

The median of the number

Quantity B

The mode of the number

5.2.5 Very poor

5.2.5 Very poor

What is the range of

What is the range of the 5 numbers listed?

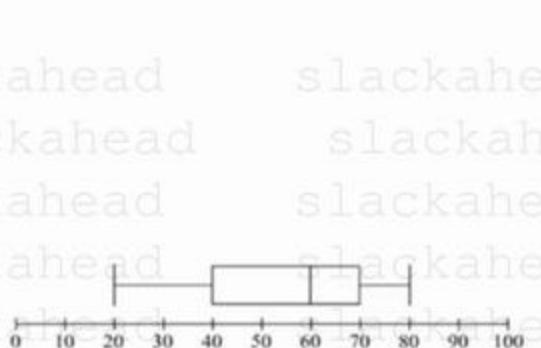


5.2.6 Quartiles and Box Plots

1.

Number of Points	Frequency
0	5
1	8
2	4
3	15
4	9
5	4
6	2
7	1
Total	48

The table above shows the number of points scored by a team in each of 48 games. What is the 3rd quartile of the distribution of the data?



The boxplot above summarizes a list of 240 numbers. Which of the following statements must be true?
Indicate all such expressions.

- The list contains the number 60.
- The range of the numbers in the list is less than 4 times the interquartile range of the numbers.
- There were more numbers in the list that are less than 40 than there are numbers that are greater than 70.



5.2.7 Percentiles

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

Quantity A

The arithmetic mean of the integers in the set

slackahead

slackahead

slackahead

slackahead

Quantity B

20

slackahead

The average (arithmetic mean) salary in Larry's company is higher than the average salary in Tony's company

The median salary in Larry's company is equal to the median salary in Tony's company

The 80th percentile in Larry's company is higher than the 70th percentile salary in Tony's company

slackahead

Quantity A

r-p

Quantity B

t-s

slackahead

slackahead

slackahead

slackahead



4.

Data set A and B are both normally distributed. In data set A, the mean is 60, standard deviation is 9, and 72 is q th percentile. In data set B, the mean is 70, standard deviation is 6, and 78 is w th percentile.

Quantity A q **Quantity B** w

5.2.8 Standard deviation

1.

Quantity A

The standard deviation of the heights of 12 children whose mean height is 50 inches

Quantity B

The standard deviation of the heights of 10 children whose mean height is 60 inches

2.

The standard deviation of n numbers $x_{\{1\}}, x_{\{2\}}, x_{\{3\}}, \dots, x_{\{n\}}$, with mean x is equal to $\sqrt{\frac{s}{n}}$, where S is the sum of the squared differences, $(x_{\{i\}} - x)^2$ for $1 \leq i \leq n$.

The mean and standard deviation of the 17 values in a list are 0 and 40, respectively. If one more value is included in the list, the mean of the 18 values will be 0. The standard deviation of the 18 values will be closest to which of the following?

 38 39 40 41 42



3.

For the numbers in set A, the average (arithmetic mean) is 5.0 and the standard deviation is 0.6. For the numbers in set B, the average (arithmetic mean) is 5.0 and the standard deviation is 0.7.

Quantity A

The standard deviation of the numbers in A after each number in that set has been increased by 3

Quantity B

The standard deviation of the numbers in B after each number in that set has been increased by 2

4.

Quantity A

The standard deviation of the numbers 45, 64, 83, and

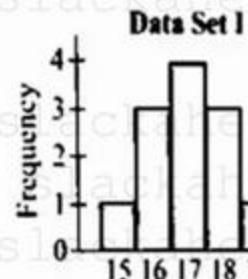
53

Quantity B

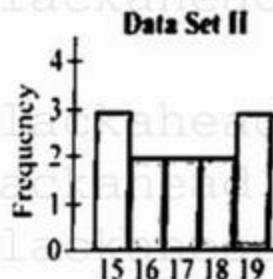
The standard deviation of the numbers 55, 81, 47, and

62

5.

**Quantity A**

The standard deviation of data set I

**Quantity B**

The standard deviation of data set II



5.2.9 Describing data with numbers Special exercise for comprehensive questions

1.

A research report states that the average (arithmetic mean) of 120 measurements was 72.5, the greatest of the 120 measurements was 92.8, and the range of the 120 measurements was 51.6.

The information given above is sufficient to determine the value of which of the following statistics?

Indicate all such statistics.

The least of the 120 measurements

The median of the 120 measurements

The standard deviation of the 120 measurements

The sum of the 120 measurements

5.3.1 Description of data distribution Special exercise

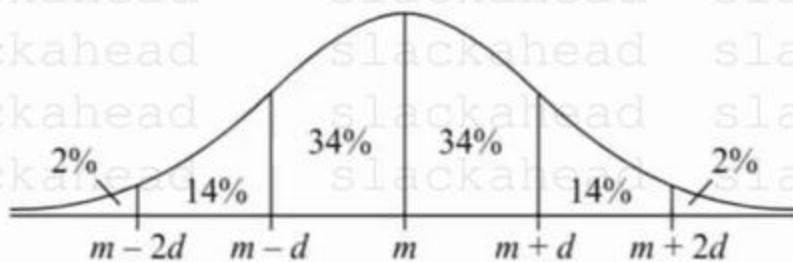
1.

As a part of an environmental study of a river, a random sample of trout was drawn from the river and the lengths of the trout were recorded. The average (arithmetic mean) length was 14.31 inches. If a length of 16.89 inches was 1.50 standard deviations above the average, what was the standard deviation of the lengths of the trout in the sample?



5.3.2 Normal distribution special exercise

1.



The figure above shows a normal distribution with mean m and standard deviation d , including approximate percents of the distribution corresponding to the six regions shown.

A survey of 5,500 book readers found that the number of books read per year was approximately normally distributed with mean 19.0 and standard deviation 2.0. Which of the following is the best description of the numbers of books read per year by the 880 book readers who read the most books?

17 or more books

19 to 21 books

21 or more books

21 to 23 books

23 or more books

5.3.3 Probability distribution special exercise

The probability distribution function f of a continuous random variable x is defined by $f(x) = \left(\frac{2}{13}\right)*|x|$ for $-3 \leq x \leq 2$

Quantity A

The median of the distribution of X

Quantity B

$-\frac{9}{5}$



6.1.1 Subset-Specific Exercises

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	Quantity A	Set X has 31 different elements inside	Quantity B
The number of subsets of Set X that have odd number of elements inside			2^{16}

6.1.2 Biset Intersection Union Complement Relation Special Exercise

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
1.	In a group of people, 30 people speak French, 40 speak Spanish, and $\frac{1}{2}$ of the people who speak Spanish do not speak French. If each person in the group speaks French, Spanish, or both, which of the following statements are true?		
Indicate all such statements.			

- Of the people in the group, 20 speak both French and Spanish.
- Of the people in the group, 10 speak French but do not speak Spanish.
- Of the people in the group, $\frac{1}{5}$ speak French but do not speak Spanish.

6.1.3 Double-overlapping application problem special practice

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
A certain museum contains a total of 1,500 works of art, of which 800 are paintings. Of the twentieth-century works of art in the museum, 40 percent are paintings. Of the works of art that are not paintings, 490 are not twentieth-century works of art.			
How many twentieth-century works of art does the museum contain?			



6.1.4 The maximum and minimum of the intersection and union of bisets

Special exercise

1.

In a sample of 45 people, 25 are married and 38 are homeowners. The least possible number of people in the sample who are married and homeowners is n .

Quantity A

n

Quantity B

18

6.1.5 Special exercise for three-set problems

1.

A college professor took attendance for the first 10 days of a class last semester. The professor noticed that Sarah attended class on 8 of those days, Andrew attended class on 7 of those days, Jeff attended class on 6 of those days, and on only 1 of those days did all three students attend class. On how many of the 10 days did at least two of the three students attend class?

days

6.2.1 Arithmetic Sequence Special Exercise

1.

In sequence T, each term after the first term is d more than the preceding term. The sum of the first 10 terms of T is 210. The sum of the first 20 terms of T is 820. What is the value of d ?

o 4

o 4.5

o 5

o 5.5

o 6



6.2.2 Special Exercises for Geometric Sequences

1.

 $Y_1, Y_2, Y_3, \dots, Y_i, \dots$

The sequence shown is defined by $Y_1=5$ and $Y_{i+1} = \frac{1}{5} Y_i$ for each positive integer.

Quantity A Y_6 **Quantity B** $(25^5)Y_{16}$

slackahead
slackahead
slackahead

slackahead
slackahead
slackahead

slackahead
slackahead
slackahead

6.2.3 Special exercises for other series of numbers

1.

In a sequence of 700 integers, each term after the first two terms is the sum of the two preceding terms.

Which of the following could be the number of odd integers in the sequence?

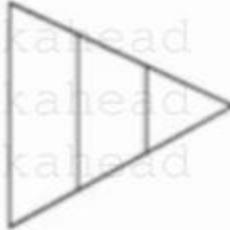
Indicate all such numbers.

- 0
- 2
- 233
- 234
- 350
- 466
- 467
- 698



6.3.1 Specific exercises on counting principles

1.



slackahead slackahead slackahead
slackahead slackahead slackahead

slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead

A banner is to be designed to have 3 regions of solid color, as shown. Colors can be repeated, but no 2 adjacent regions can have the same color. How many different designs are possible if the colors are chosen from blue, green, red, white, and yellow?

slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead 20 slackahead
slackahead slackahead 36 slackahead
slackahead slackahead 60 slackahead
slackahead slackahead 72 slackahead

80

slackahead slackahead slackahead
slackahead slackahead slackahead

6.3.2 Special exercise on factorial

1.

Quantity A

$$\frac{n!}{(\frac{n}{2})!}$$

slackahead slackahead slackahead
slackahead slackahead slackahead

Quantity B

$$2(\frac{n}{2})!$$

slackahead slackahead slackahead
slackahead slackahead slackahead

n is an even integer greater than 2



6.3.3 Arrangement-specific exercises

1.

How many 6-digit integers greater than 321,000 can be formed such that each of the digits 1, 2, 3, 4, 5, and 6 is used once in each 6-digit integer?

slackahead

slackahead

slackahead

slackahead

6.3.4 Combination specific exercises

1.

The budget of 5 countries are 0.7 billion, 1.3 billion, 1.7 billion, 2.7 billion and 3.2 billion, respectively. In how many ways can you select 3 countries from all the countries such that the total budget of these 3 countries is over 4 billion?

slackahead

slackahead

slackahead

slackahead

6.3.5 Special exercises for special arrangement and combination skills

1.

A committee of 4 people consisting of 2 men and 2 women is to be selected from 5 sets of fraternal twins, where each set consists of one man and one woman. If only 1 person from each set of twins may be selected for the committee, what is the total number of distinct committees that can be formed?

 5 10 20 30 40



6.4.1 Specific exercises in classical probability

1.

0	1	1	1	1	1	1	1	1	1
0	0	1	1	1	1	1	1	1	1
0	0	0	1	1	1	1	1	1	1
0	0	0	0	1	1	1	1	1	1
0	0	0	0	0	1	1	1	1	1
0	0	0	0	0	0	1	1	1	1
0	0	0	0	0	0	0	1	1	1
0	0	0	0	0	0	0	0	1	1
0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0

Several 0 and 1 are arranged in a 10×10 palace as follows. Among all the number 0, what is the probability that they are arranged in both an odd row and an odd column?

Give your answer as a fraction.

6.4.2 Special Exercises for Mutually Exclusive Events and Contradictory Events

1.

If Event X happens, it has five possible outcomes (A, B, C, D and E) in total. The probability that outcome A, B and D respectively occurs is listed as follows. If the probability that outcome C occurs is twice the probability that outcome E occurs, then what is the probability that outcome C occurs?

A	B	C	D	E
1/3	1/6		1/6	

Give your answer in fraction.



6.4.3 Independent event specific exercises

1.

A telephone system has n telephone lines. For each of the n lines, the event that the line will fail during a certain reliability test has probability 0.3, and these n events are independent. If the probability that at least one of the n lines will not fail during the reliability test is greater than 0.99, what is the minimum value of n ?

01

02

03

04

05

6.4.4 Special exercise on conditional probability

1.

A box contains 12 candies of four different flavors. The table above shows the numbers of candies of each flavor. If 2 candies are to be selected at random from the box, without replacement, what is the probability that of the 2 candies selected one will be a caramel candy and the other will be a cherry candy?

$\frac{5}{12}$

$\frac{5}{22}$

$\frac{5}{24}$

$\frac{5}{33}$

$\frac{5}{66}$



6.4.5 Special Exercise on the Principle of Inclusion and Exclusion in Probability

slackahead

slackahead

1.

If the probability that event R will occur is 0.75, and the probability that event M will occur is 0.58, which of the following is equal to the maximum probability that both events will occur?

slackahead

slackahead

0.58

slackahead

0.75

slackahead

0.58+0.75

slackahead

$\frac{(0.58+0.75)}{2}$

slackahead

0.58+0.75-(0.58)(0.75)

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

2.

A and B are mutually independent and the probability that Event A occurs is the same as that of the probability that Event B occurs (both equals to 0.3).

slackahead

slackahead

Quantity A

The probability that Event A occurs when Event B

does not occur

slackahead

Quantity B

0.3

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead



Math latest 170 puzzles

Section 1

1.

The sum of three different positive integers is 11.

Which two of the following statements together provide sufficient information to determine the three integers?

Indicate two such statements.

None of the three integers is 1.

None of the three integers is 4.

None of the three integers is 7.

None of the three integers is 8.

2.

Each of the offices on the second floor of a certain building has a floor area of either 250 or 300 square feet. The total space of these offices is 5,750 square feet.

Quantity A

The number of these offices with floor areas of 250 square feet

Quantity B

The number of these offices with floor areas of 300 square feet



3.

$$(5^3)w + (5^2)x + 5y + z = 264$$

In the equation shown, w, x, y and z are integers that are no less than 0 and no greater than 5. What is the sum of w+x+y+z?

Indicate all such values.

- slackahead
- slackahead
- slackahead
- slackahead
- slackahead
- 5

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

4.

- 6
- 8
- 9
- 10
- 12
- slackahead
- slackahead
- slackahead
- slackahead

Weekly Rental Rates for Realtor M's Summer Houses on Island X

Location	Number of Bedrooms in House		
	2 Bedrooms	3 Bedrooms	4 Bedrooms
Oceanside	\$800	\$900	\$1,000
Bayside	\$600	\$700	\$800
Inland	\$500	\$600	\$700

A group of 10 couples plans to rent bayside summer houses on Island X from Realtor M for a certain week. The total rental cost for the houses will be evenly distributed among the 10 couples, and each couple will have their own bedroom. If Realtor M has at least three bayside summer houses of each type available that week, what is the least possible rental cost per couple?

- \$400
- \$300
- \$240
- \$220
- \$190



5.

Number of Tickets	Cost
1	\$1.25
10	\$11.00
20	\$20.00

Tickets for a carnival are sold either individually or in packages of 10 tickets or 20 tickets at the costs shown in the table. A group of friends bought n tickets for the least possible total cost. A second group of friends bought more than n tickets for a total cost that was less than the first group's total cost. Which of the following could be the value of n ?

Indicate all such values.

 8 9 11 12 16 17 18 19

slackahead



7.

In a certain sequence, each term after the first is equal to the preceding term multiplied by $-\frac{1}{2}$. If the 200th term is positive, which of the following statements must be true?

Indicate all such statements.

The 10th term is positive

The sum of any 2 consecutive terms is positive

The product of any 3 consecutive terms is positive

8.

In a sequence of 700 integers, each term after the first two terms is the sum of the two preceding terms.

Which of the following could be the number of odd integers in the sequence?

Indicate all such numbers.

0

2

233

234

350

466

467

698



4.

Let x and y be positive integers such that when y is divided by x , the remainder is 4, and when $y+10$ is divided by x , the remainder is 2.

Which of the following must be an integer?

- $\frac{2y+4}{x}$
 $\frac{3y+4}{x}$
 $\frac{5y+6}{x}$

- $\frac{2x+4}{y}$

- $\frac{5x+6}{y}$

5.

When positive integer n is divided by 53, the remainder is 21, and when positive integer p is divided by 53, the remainder is 25.

What is the remainder when the product np is divided by 53?

6.

Let n be a nonnegative integer such that when $6n$ is divided by 75, the remainder is 30. Which of the following is a list of all possible remainders when $7n$ is divided by 75?

- 5, 35

- 10, 55

- 35, 60

- 5, 30, 55

- 10, 35, 60



7.

When positive integers k and n are each divided by 9, the remainders are 2 and 5, respectively. If $k > n$, what is the remainder when $k-n$ is divided by 9?

- slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead O 2 slackahead
slackahead O 3 slackahead
slackahead O 4 slackahead

- slackahead O 5 slackahead
slackahead O 6 slackahead
slackahead slackahead

If n, k , and r are positive integers such that $n^k = 10r+3$, which of the following could be the value of n ?

- slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead O 11 slackahead
slackahead O 12 slackahead

O 15

- slackahead O 17 slackahead
slackaheads slackahead slackahead

O 19

- slackahead slackahead slackahead
slackahead slackahead slackahead

9.

What is the tens digit of $21^{(3^5)}$?

- slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead O 0 slackahead
slackahead O 2 slackahead
slackahead O 4 slackahead
slackahead O 6 slackahead

O 8



10.

If p is an prime number greater than 5, and if 5 is a factor of $p + p^2$, which of the following might be the remainder when p is divided by 5?

Indicate all such numbers.

 1 2 3 4

Section 3

slackahead

1.

slackahead

Quantity A

The remainder when 754,975,376 is divided by 4

Quantity B

The remainder when 701,864,294 is divided by 4

slackahead

slackahead

slackahead

What is the remainder when $(345,606)^2$ is divided by 20?

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

The number 24 has the property that it is divisible by its units digit, 4. How many of the integers between 10 and 70 are divisible by their respective units digits?

slackahead



10.

slackahead slackahead slackahead slackahead

At a certain high school, 90 percent of seniors who take physics also take calculus and 60 percent of seniors who take calculus also take physics. If 30 percent of seniors at the school take physics, what percent of seniors take calculus?

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead

Section 4

1.

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

The acreage of Hopetown, a town in Lewis County, is equal to 20 percent of the acreage of the region that is in Lewis County but not in Hopetown.

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

Quantity A**Quantity B**

The acreage of Hopetown as a percent of the entire acreage of Lewis County

18%

2.

slackahead slackahead slackahead slackahead

During a certain month, 20 percent of all the electricity used by a household was used by the water heater. The cost per kilowatt-hour of the electricity used by the water heater was half the cost per kilowatt-hour of the rest of the electricity used. For that month, the cost of the electricity used by the water heater was what fraction of the cost of the electricity used by the household?

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

 $\textcircled{O} \frac{1}{20}$

slackahead slackahead slackahead slackahead

 $\textcircled{O} \frac{1}{9}$

slackahead slackahead slackahead slackahead

 $\textcircled{O} \frac{1}{8}$

slackahead slackahead slackahead slackahead

 $\textcircled{O} \frac{1}{5}$

slackahead slackahead slackahead slackahead

 $\textcircled{O} \frac{1}{3}$



3.

slackahead

slackahead

slackahead

slackahead

Greg's weekly salary is \$187, which is 15 percent less than Karla's weekly salary. If Karla's weekly salary increases by 10 percent, by what percent must Greg's weekly salary increase in order to equal Karla's new weekly salary?

Give your answer to the nearest tenth of a percent.

slackahead

slackahead

slackahead

slackahead

4.

slackahead

slackahead

slackahead

slackahead

One day in 1997 at a gas station in the United States near the border of Canada, gasoline was selling for \$1.20 per gallon (United States dollars). On that day, 1 United States dollar could be exchanged for 1.25 Canadian dollars. If gasoline was being sold at an equivalent rate at a gas station across the border in Canada, which of the following calculations gives an approximate price, in Canadian dollars, for a liter of gasoline at the Canadian gas station that day? (1 gallon is approximately 3.785 liters.)

slackahead



7.

Machines A and B each assembled 3,000 metal clips in 15 hours and 12 hours, respectively, working alone at their constant rates. On Monday, working simultaneously at their respective constant rates, the two machines assembled a total of n clips in x hours. The next day, machine A was modified so that its constant rate decreased by 25 percent. If the two machines worked simultaneously at their respective constant rates for x hours after the modification of machine A, then the total number of clips that they assembled in x hours was approximately what percent less than it was the day before?

 6% 11% 16% 20% 25%

8.

A large pump and a small pump are available to fill a public fountain with 7,500 gallons of water. The pumps can be used alone or simultaneously. Working alone at their respective constant rates, the small pump would take 1.6 times as long as the large pump to fill the fountain. Working simultaneously at their respective constant rates, the two pumps would take 3 hours to fill the fountain. How long would the small pump take to fill the fountain, working alone at its constant rate?

_____ hours

9.

The average (arithmetic mean) of the values of the homes in Town A is \$100,000. The average of the values of the homes in Town B is \$150,000. The number of homes in Town A is between 2 times and 3 times the number of homes in Town B. Which of the following values could be the average of the values of the homes in Town A and Town B combined?

Indicate all such values.

 \$111,000 \$113,500 \$115,000 \$118,500



10.

A catalog company had a special sale that offered a discount of \$25 off each \$75 in merchandise ordered. A shipping charge of 10 percent was calculated before the discount was taken, and sales tax of 5 percent was calculated after the discount was taken. If Jason ordered \$300 in merchandise and no tax was calculated on shipping charges, what was the total charge for Jason's order?

\$230

\$240

\$250

\$260

\$270

Section 5

1.

A certain charity is conducting a fund-raiser. For the first \$9,000 raised by the charity, Company B will contribute \$1 for every \$3 collected by the charity. For any amount over \$9,000 raised by the charity, Company B will contribute \$2 for every \$5 collected by the charity. How much money must the charity raise in order to reach a total of \$68,000, including the contribution from Company B?

\$34,000

\$40,000

\$45,000

\$49,000

\$56,000



2.

A box contains 100 purple balls, 100 red balls, and 100 white balls. What is the minimum number of balls that must be chosen to ensure that at least 4 of the balls chosen have the same color?

 5 9 10 12 13

3.

If a , b , and c are positive integers such that $\frac{a}{c} = 0.075$, and $\frac{b}{c} = 0.09$, What is the least possible value of c ?

slackahead
slackahead

slackahead
slackahead

slackahead
slackahead

slackahead
slackahead

slackahead
slackahead

slackahead
slackaheads

slackahead
slackahead

Quantity A \sqrt{y} **Quantity B** $\frac{y}{100}$

5.

S is an integer that is greater than 2.

Quantity A

The average (arithmetic mean) of $\frac{1}{S^2}$, $\frac{1}{S}$, S , and S^2

Quantity B $2S$



6.

Quantity A

Quantity B

Quantity A

The ratio of the sum of the areas of the black sections
to the sum of the areas of the white sections

Quantity B

2

8. The probability that the result in heads is greater than 50%.

9. The probability that the result in heads is greater than 50%.

Quantity A

5

10

$$x < x^3 < x^5$$

Quantity B

37



3.

slackahead slackahead slackahead slackahead

On her walk today, Emma walked along a straight path between the entrance to her house, H, and the entrance to library, L, passing a crosswalk sign, J, and then a crosswalk sign, K. First Emma walked from H to J and then turned around and walked back from J to H.

Then she walked directly from H to L, stopping briefly at J and K on her way. The total distance that Emma walked from H to J and back from J to H was $\frac{2}{9}$ of the distance that she walked directly from H to K and $\frac{1}{6}$ of the distance that she walked directly from H to L.

If Emma walked a total of 420 meters during her walk today, what was the distance, in meters, that she walked from K to L?

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

 84slackahead 90 slackahead slackaheadslackahead 100 slackahead slackaheadslackahead 105 slackahead slackaheadslackahead 120 slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

4.

If $x \geq 0$, $y \geq 0$, and $x^2 + y^2 = 1$, which of the following statements must be true?

Indicate all such statements.

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackaheads slackahead slackahead

slackahead slackahead slackahead slackahead

 $x \geq 1$ $y \leq 1$ $y \geq 1$ $x+y \leq 1$ $x+y \geq 1$

slackahead slackahead slackahead slackahead

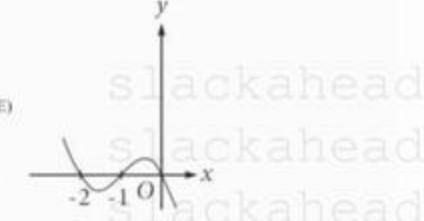
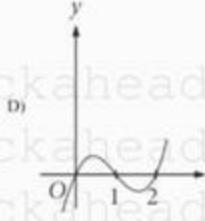
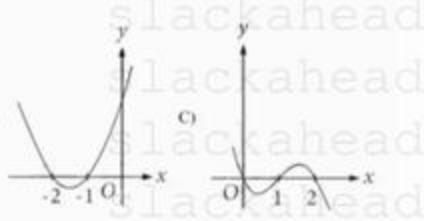
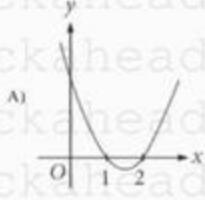
slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead



8.

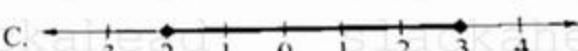
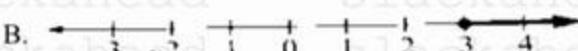
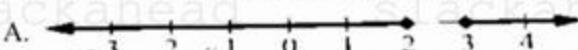
Of the following, which best represents the graph of the function $y = (x^2 - x)(x - 2)$?



- O A slackahead
O B slackahead
O C slackahead
O D slackahead
O E slackahead

9.

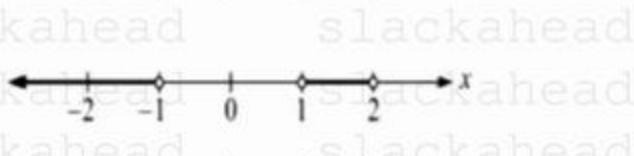
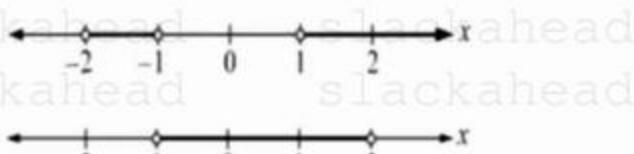
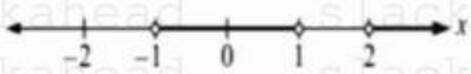
On the number line, which of the following represents the solution set of the inequality $x^2 - 5x + 6 \leq 0$?



- O A slackahead
O B slackahead
O C
O D
O E



If $y = (x-2)(x-1)(x+1)$, which of the following graphs indicates all of the values of x for which y is positive?

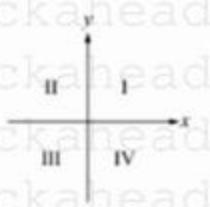


- slackahead
slackahead
slackahead
O A slackahead
O B slackahead
O C slackahead
O D slackahead
O E slackahead



Section 7

slackahead
slackahead
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slackahead
slackahead
slackahead
1.



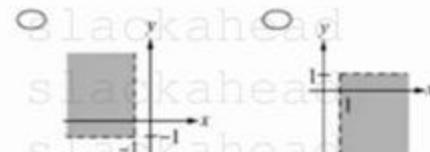
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slackahead
slackahead

Which of the following shaded regions represents the set of all points (a,b) in the xy -plane above such that $(a+1, b+1)$ is in quadrant 1?
(note that a point lies on axis is not in any quadrant)

slackahead
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slackahead
2.



slackahead
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slackahead
slackahead

- O A slackahead
O B slackahead
O C slackahead

slackahead
slackahead
slackahead
2.
slackahead
slackahead
slackahead

- O D slackahead
O E slackahead
slackahead slackahead

slackahead
slackahead
slackahead

In the xy -plane, line k has a positive slope and intersects the line $y=4-x$ at a point with x -coordinate 3. Which of the following values could be the y -intercept of k ?

Indicate all such values.
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

- slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead
 6 slackahead
slackahead slackahead
 4 slackahead
slackahead slackahead
 2 slackahead

- 0
 -2
 -4



3.

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

How many x-intercepts, and y-intercepts does the graph of the equation $4x^2 - 9y^2 = 1$ have?

- slackahead slackahead slackahead
slackahead slackahead slackahead
- No x-intercepts and two y-intercepts
 - One x-intercept and two y-intercepts
 - Two x-intercepts and no y-intercepts
 - Two x-intercepts and one y-intercept

slackahead
slackahead
slackahead
slackahead

4.

slackahead
slackahead
slackahead
slackahead

In the xy-plane, a triangle has vertices $(0, 3)$, $(b, 3)$, and $(0, 3b)$, where b is a constant. If the area of the triangle is 18, which of the following is a possible value of b ?

- slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead
 -4 slackahead
 -3

slackahead
slackahead
slackahead
slackahead
slackahead

- slackahead 2 slackahead
slackahead 3 slackahead
slackahead 6 slackahead
slackahead slackahead
slackahead slackahead

slackahead
slackahead
slackahead
slackahead
slackahead

5. In the xy-plane, line segment RS is a side of a square. The coordinates of R are $(2, 10)$ and the coordinates of the midpoint of RS are $(7, 12)$. Which of the following CANNOT be the coordinates of a vertex of the square?

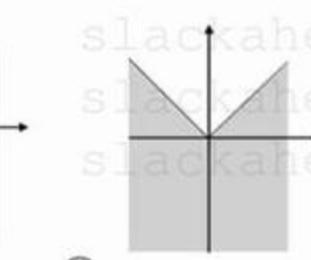
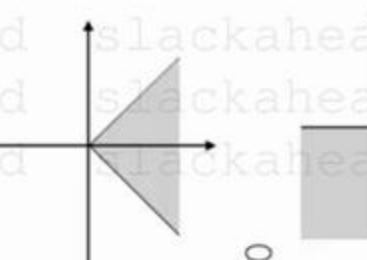
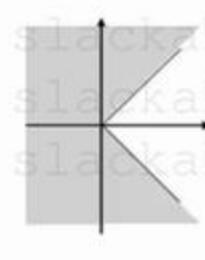
- slackahead slackahead
slackahead slackahead
slackahead slackahead
 (6, 0) slackahead
slackahead slackahead
slackahead slackahead
 (8, 4) slackahead
slackahead slackahead
 (8, 24) slackahead
slackahead slackahead

- (12, 14)
- (16, 4)



6

Of the following, which graph best represents a shaded region in which every point (x, y) satisfies the inequality $y \leq |x|$?



7.

A hexagon with sides of equal length and interior angles of equal measure is inscribed in a circle. If the perimeter of the hexagon is 12, what is the perimeter of an equilateral triangle inscribed in the same circle?

○ 6

○ 9

$$\circ 2\sqrt{3}$$

slackahead \circ $3\sqrt{3}$ slackahead
slackahead \circ $6\sqrt{3}$ slackahead

8

A circle is inscribed in a regular octagon. If the perimeter of the octagon is 16, what is the circumference of the circle?

$$\odot 2\sqrt{2}z$$

$$\mathcal{O}(2 + \sqrt{2})$$

$\circ 3\sqrt{2}\pi$

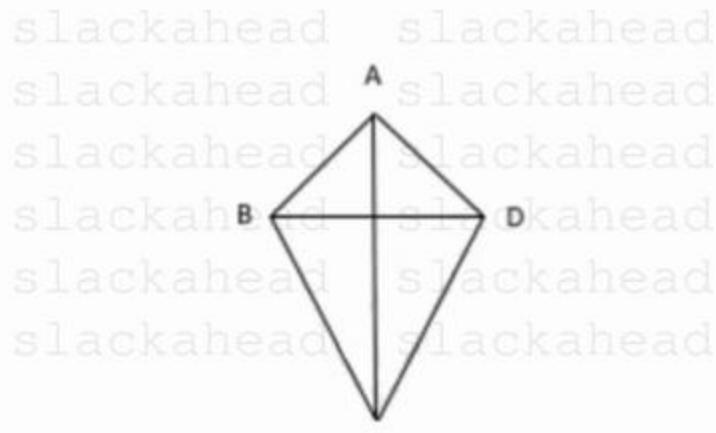
$$\circ (2 + 2\sqrt{2})\pi$$

$$\approx 4\sqrt{2}\pi$$



9.

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead



Quantity A

The perimeter of ABCD

- Quantity A is greater.
- Quantity B is greater.
- The two quantities are equal.

Quantity B

The sum of the lengths of diagonals AC and BD

- The relationship cannot be determined from the information given.

10.

Alice and Eddie are each flying a kite on level ground. A taut string extends from Alice's hand to her kite so that the length of the string between the end A in her hand and the end X attached to her kite is 105 meters and A is 2 meters above the ground. A taut string extends from Eddie's hand to his kite so that the length of the string between the end B in his hand and the end Y attached to his kite is 110 meters and B is 1 meter above the ground. At a certain moment, when X and Y are directly above each other, the point on the ground directly below X and Y is 5 meters and 45 meters, respectively, from the points on the ground directly below A and B. Which of the following statements is true about the relative heights of X and Y above the ground at that moment?

- X is approximately 5 meters higher than Y
- X is approximately 10 meters higher than Y
- The distance between X and Y is less than 1 meter
- Y is approximately 5 meters higher than X
- Y is approximately 10 meters higher than X



slackahead

Section 8

1.

In triangle ABC, the length of side AB is 13, the length of side AC is 15, and the length of side BC is 14. What is the length of the height that corresponds to the base BC?

slackahead

2.

The lengths of the sides of triangle RST are 3, 4, and y . Which of the following inequalities specifies those values of y for which each angle measure of triangle RST is less than 90° ?

$$\circ 1 < y < 5$$

$$\circ 1 < y < 6$$

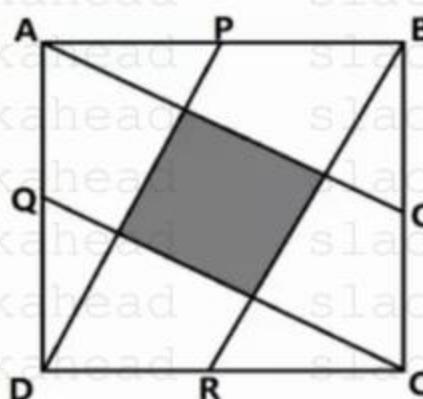
$$\circ \sqrt{7} < y < 5$$

$$\circ \sqrt{7} < y < 6$$

slackahead

slackahead

3.



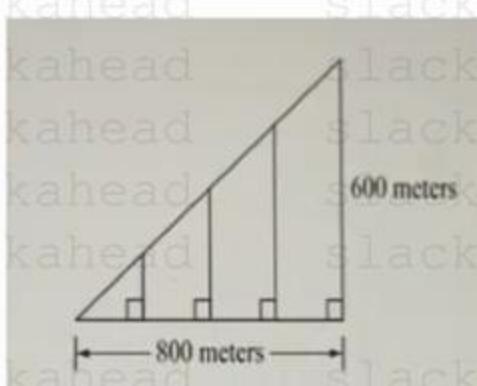
$$\circ 2 < y < 5$$

In the square above, the side is 10, and points P, Q, O, and R are all midpoints of each side. What is the area of the shaded region?



slackahead

4.



The figure above represents six straight city streets that will be repaved. The figure shows only the centerlines of the streets, and all the streets have the same width. Four of the streets are parallel, with centerlines that are 200 meters apart from each other. If the cost to repair each street is estimated as \$72,000 per kilometer of the length of its centerline, what is the total estimated cost to repave the six streets?

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\$ _____

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slackahead

5.

On each side of a parade route, spectators occupy a sidewalk that is 10 feet wide and 1.5 miles long. The parade organizers estimate that the average amount of sidewalk space occupied per spectator is 6 square feet. Based on this estimate, which of the following is closest to the total number of spectators occupying the two sidewalks? (1 mile = 5,280 feet)

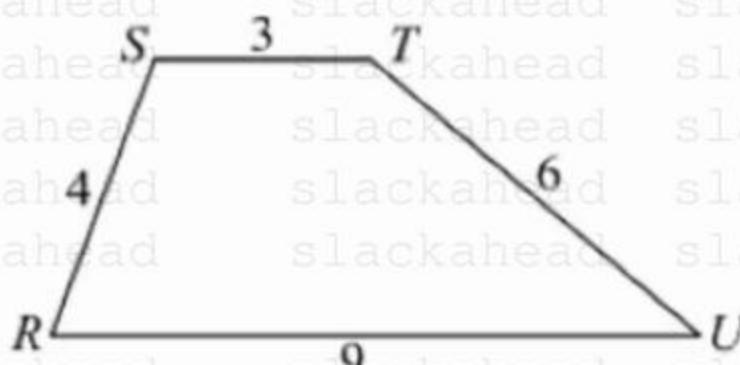
9,000

14,000

18,000

22,000

26,000



The parallel sides (bases) of trapezoid RSTU have lengths 3 and 9, and the nonparallel sides have lengths 4 and 6, as shown in the figure. Line segment AB (not shown) is parallel to the two bases of RSTU with point A on side RS and point B on side TU. If AB divides the trapezoid into two trapezoids having equal perimeters, what is the sum of the lengths of the nonparallel sides of trapezoid RABU?

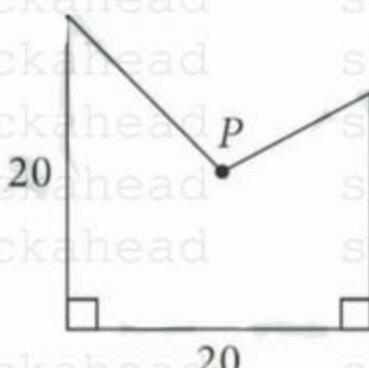
RABU?

- The figure consists of three vertically stacked scatter plots. Each plot has 'slackahead' on both the x-axis and y-axis. The top plot is labeled '2.0', the middle '2.5', and the bottom '3.0'. In each plot, there are two main clusters of points: one centered around (0,0) and another centered around (1,1). A diagonal line from (0,0) to (1,1) is shown in each plot.



slackahead

7.



slackahead

The figure above represents the surface of a wall with an irregular shape, where all measurements are in meters and point P is 10 meters from the bottom edge and 10 meters from the left edge. The surface is to be painted, and one bucket of paint will cover 170 square meters of the surface. If the bucket of paint will cover the part of the surface from the left edge to a vertical line that is x meters from the left edge, which of the following is true?

8 < x < 9

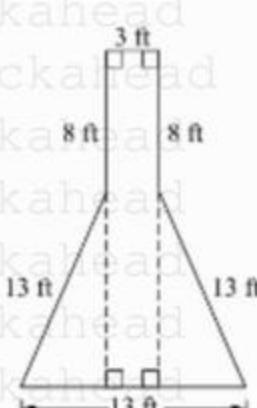
9 < x < 10

10 < x < 11

11 < x < 12

12 < x < 13

8.



slackahead slackahead

slackaheads slackahead

slackahead slackahead

A homeowner wants to pour concrete for a new patio and walkway according to the layout shown above. If the concrete is to be $\frac{1}{3}$ foot thick, how many cubic feet of concrete will be needed to form the patio and walkway?

60

50

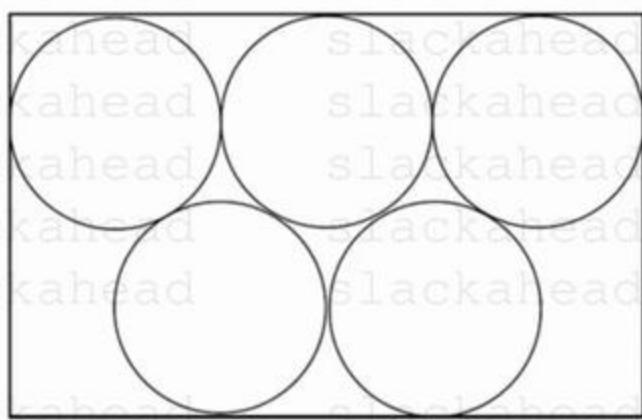
40

30

20



9.



The figure above shows a rectangle and five circles. Each circle is tangent to the other circles and to the sides of the rectangle that it touches. If the diameter of each circle is 4, what is the area of the rectangle?

24+12 $\sqrt{2}$

24+12 $\sqrt{3}$

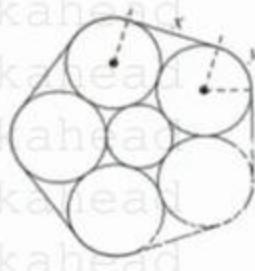
48+24 $\sqrt{2}$

48+24 $\sqrt{3}$

96



10.



The figure above shows five congruent circles each with radius 2 such that each of the five circles is tangent to two other congruent circles and to a smaller inner circle. The perimeter of the figure is composed of 5 line segments of length x and 5 circular arcs of length y . What is the perimeter of the figure?

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slackahead

- $5\pi + 15$
- $4\pi + 20$
- $5\pi + 20$
- $4\pi + 25$
- $5\pi + 25$

Section 9

slackahead

1. slackahead

The 105th Congress of the United States
(535 members)

	House of Representatives	Senate
Number of Members	435	100
Republicans	52%	55%
Democrats	48%	45%
Men	88%	91%
Women	12%	9%
Prior election experience	66%	81%
Lawyers	40%	56%
Military experience	31%	48%

Note: Percents have been rounded.

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Which of the following is closest to the number of members of the 105th Congress who had military experience?

- 120
- 140
- 160
- 180
- 200



2.

The 105th Congress of the United States
(535 members)

	House of Representatives	Senate
Number of Members	435	100
Republicans	52%	55%
Democrats	48%	45%
Men	88%	91%
Women	12%	9%
Prior election experience	66%	81%
Lawyers	40%	56%
Military experience	31%	48%

Note: Percents have been rounded.

What is the least possible number of male members of the Senate in the 105th Congress who had prior election experience?

66

68

72

76

81

Select the two answer choices that, when used to complete the sentence, fit the meaning of the sentence as a whole and produce completed sentences that are alike in meaning.

The 105th Congress of the United States
(535 members)

	House of Representatives	Senate
Number of Members	435	100
Republicans	52%	55%
Democrats	48%	45%
Men	88%	91%
Women	12%	9%
Prior election experience	66%	81%
Lawyers	40%	56%
Military experience	31%	48%

Note: Percents have been rounded.

Based on the information given, which of the following statements about the members of the 105th Congress must be true?

Indicate all such statements.

More female members of the 105th Congress were Democrats than were Republican.

More members of the Senate than members of the House of Representatives were Republicans.

More than 280 members of the House of Representatives had prior election experience.

3.



4

PRICE OF WOODEN BOARDS, BY BOARD WIDTH AND TYPE OF WOOD

in dollars per linear foot

Board Width (in inches)	Type of Wood		
	Maple	Oak	Poplar
4	\$1.50	\$1.70	\$1.00
6	\$2.25	\$2.65	\$1.60
8	\$2.90	\$3.20	\$2.20
10	\$3.75	\$4.25	\$2.75
12	\$4.25	\$5.55	\$3.45

Note: All types of boards listed are 1 inch thick.

5.

PRICE OF WOODEN BOARDS, BY BOARD WIDTH AND TYPE OF WOOD

in dollars per linear foot

Board Width (in inches)	Type of Wood		
	Maple	Oak	Poplar
4	\$1.50	\$1.70	\$1.00
6	\$2.25	\$2.65	\$1.60
8	\$2.90	\$3.20	\$2.20
10	\$3.75	\$4.25	\$2.75
12	\$4.25	\$5.55	\$3.45

Note: All types of boards listed are 1 inch thick.

6

PRICE OF WOODEN BOARDS, BY BOARD WIDTH AND TYPE OF WOOD

in dollars per linear foot

Board Width (in inches)	Type of Wood		
	Maple	Oak	Poplar
4	\$1.50	\$1.70	\$1.00
6	\$2.25	\$2.65	\$1.60
8	\$2.90	\$3.20	\$2.20
10	\$3.75	\$4.25	\$2.75
12	\$4.25	\$5.55	\$3.45

Note: All types of boards listed are 1 inch thick.

The top surface of a certain 1-inch-thick oak board is 8 inches wide and has an area of 960 square inches. What is the price of this board? (1 foot=12 inches)

- \$26.40
 - \$29.00
 - \$32.00
 - \$34.80

For the 6-inch-wide boards listed, which of the following is closest to the ratio of the price per linear foot of the least expensive type of board to the price per linear foot of the most expensive type of board?

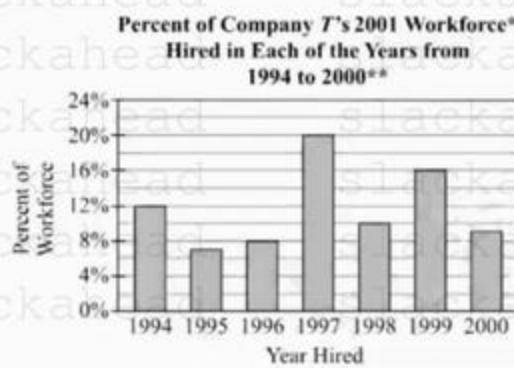
- 1 to 2
 - 1 to 3
 - 3 to 4
 - 3 to 5
 - 3 to 6

The price of one maple board that is 8 inches wide and n feet long is \$1.50 less than the price of 2 maple boards that are each 4 inches wide and n feet long. What is the value of n ?

- 8
ackahead
 - 10
ackahead
 - 12
kahead
 - 15
kahead
 - 20
ackahead



7.



*The 2001 workforce is the total number of employees of Company T as of Dec. 31, 2000.

**Percents for years prior to 1994 not included in graph.

Of the employees in the 2001 workforce who were hired in 1997, 40 percent were hired to fill positions in a new subdivision of Company I. Approximately how many of the employees in the 2001 workforce were hired in 1997 to fill positions in the new subdivision?

130

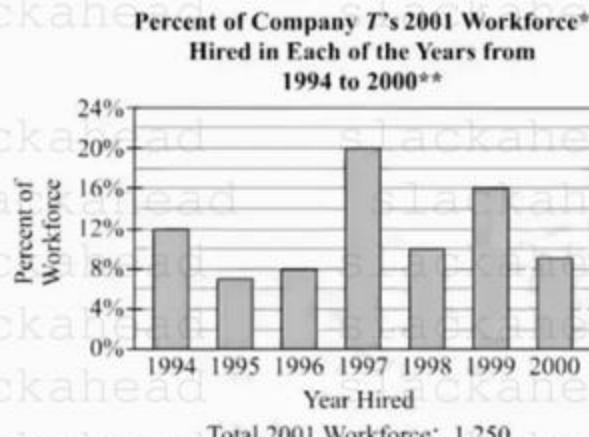
125

120

115

100

8.



*The 2001 workforce is the total number of employees of Company T as of Dec. 31, 2000.

**Percents for years prior to 1994 not included in graph.

If the ratio of the number of employees in the 2001 workforce who were hired in 1996 to the total number of employees hired in 1996 was 2 to 3, approximately what was the total number of employees hired in 1996?

120

130

140

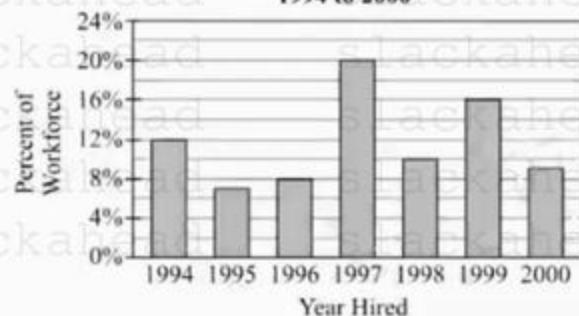
150

160



9.

**Percent of Company T's 2001 Workforce*
Hired in Each of the Years from
1994 to 2000****



Total 2001 Workforce: 1,250

*The 2001 workforce is the total number of employees of Company T as of Dec. 31, 2000.

**Percents for years prior to 1994 not included in graph.

In the 2001 workforce, the average (arithmetic mean) salary of the employees hired prior to 1999 was \$39,900, and the average salary of the employees hired in 1999 and 2000 was \$30,100. Which of the following is closest to the average salary of all employees in the 2001 workforce?

\$30,500

\$32,500

\$35,000

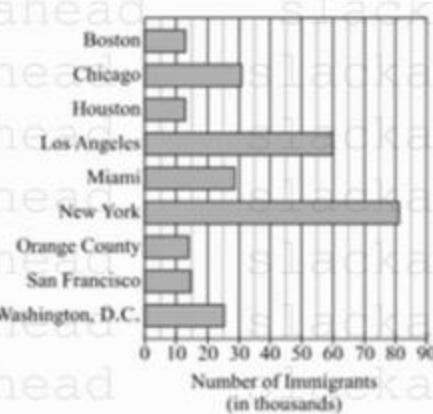
\$37,500

\$39,000

10.

The graph shows the numbers of all immigrants admitted to the United States in year Y who intended to reside in nine selected areas.

Selected Areas of Residence



For year Y, approximately what was the median of the numbers of immigrants admitted to the United States who intended to reside in the nine areas shown?

15,000

20,000

25,000

30,000

35,000

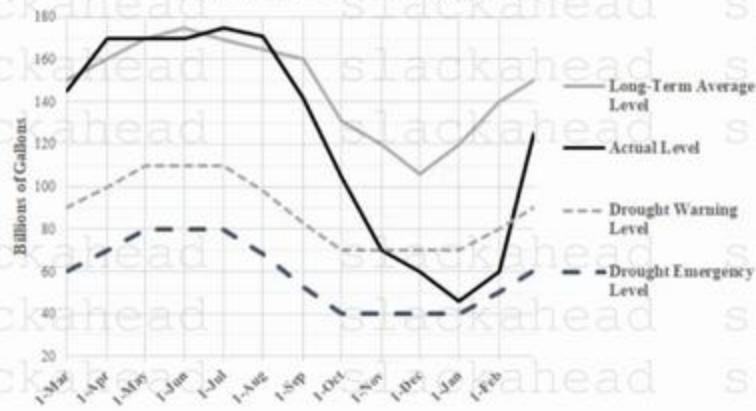


Section 10

slackahead
slackahead
1.

slackahead

Daily Water Levels for Reservoir H
March 1, 2000, to February 28, 2001



The time period during which the actual water level was lower than the drought warning water level was approximately what fraction of the one-year period shown?

O $\frac{1}{6}$

O $\frac{1}{5}$

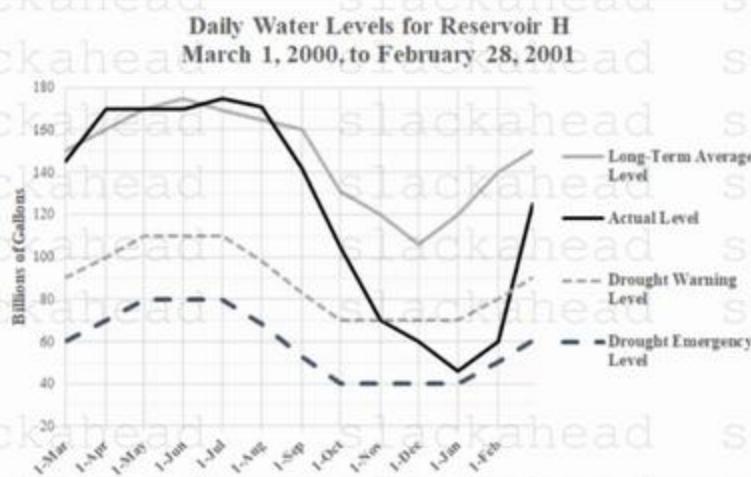
O $\frac{7}{24}$

O $\frac{3}{8}$

O $\frac{5}{12}$



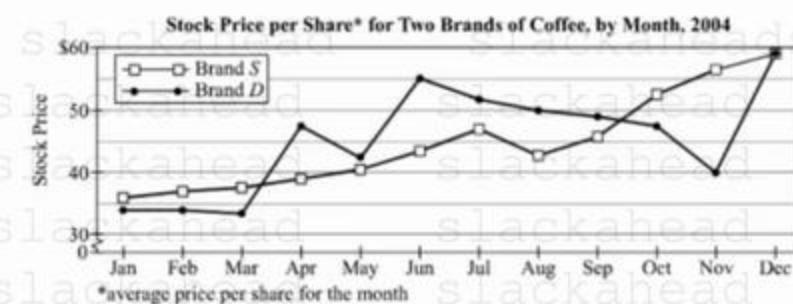
2.



A date is to be selected at random from the 12 dates labeled on the graph. Which of the following is closest to the probability that the actual water level for the date selected will be at least 40 billion gallons greater than the drought warning water level for that date?

- 0.60
- 0.65
- 0.70
- 0.75
- 0.80

3.

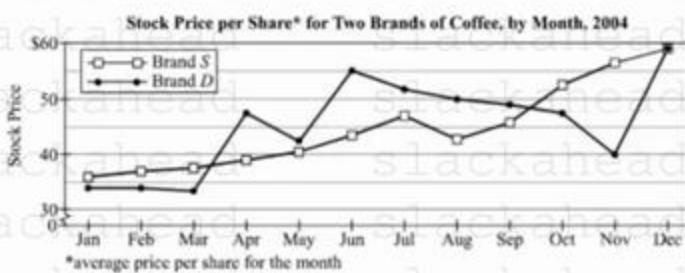


By approximately what percent did the stock price per share of Brand S coffee increase from January to December?

- 25%
- 40%
- 65%
- 150%
- 250%



4.



For each of the 5 months July through November, the stock price per share of Brand D coffee decreased from the price for the preceding month. Which of the following is closest to the average (arithmetic mean) of the 5 decreases in price per share?

\$1

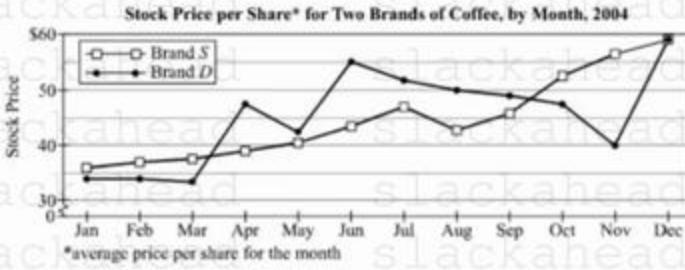
\$2

\$3

\$4

\$5

5.



From the graph, Joe read the stock prices for three consecutive months for Brand D coffee. Which of the following is closest to the maximum possible range of the three stock prices that Joe read?

\$12

\$15

\$19

\$22

\$25

6.



For which of the first five years shown was the total annual per capita consumption of coffee and ice cream combined closest to the annual per capita consumption of poultry?

1920

1930

1940

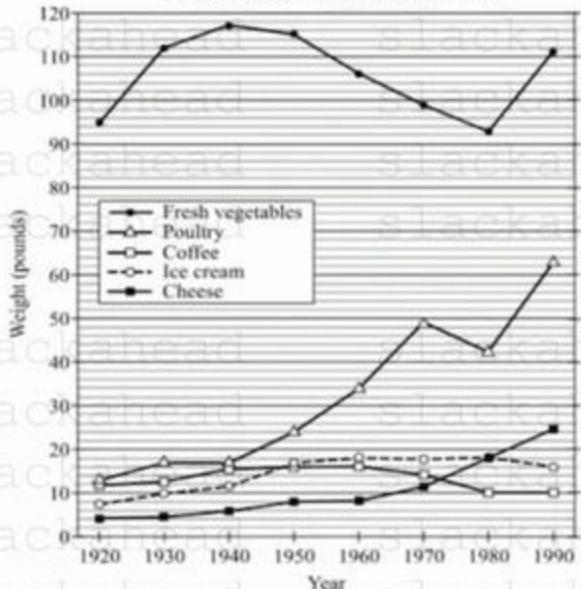
1950

1960



7.

Annual Per Capita Consumption of Five Foods in the United States for Selected Years



The population of the United States was approximately 106 million in 1920 and approximately 249 million in 1990. Based on these population estimates, approximately how many million pounds greater was the total annual consumption of cheese in 1990 than in 1920?

1,000

2,000

4,000

6,000

8,000

Let a , b , and c represent the ranges of the annual per capita consumption of fresh vegetables, poultry, and ice cream, respectively, for the eight years shown. Which of the following statements is true?

$a > b > c$

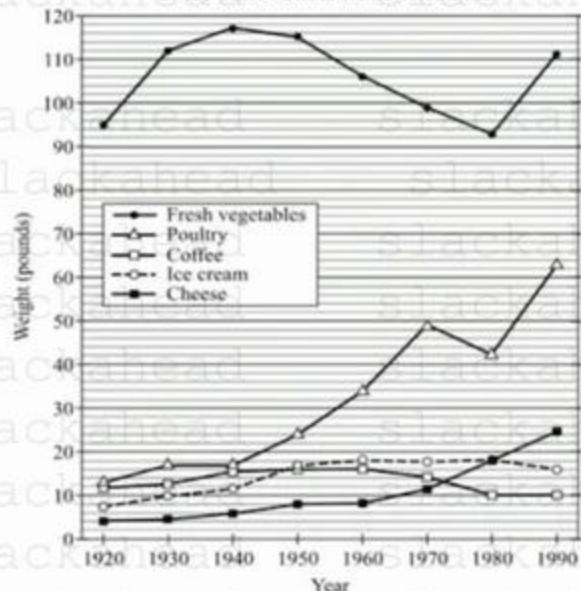
$a > c > b$

$b > a > c$

$b > c > a$

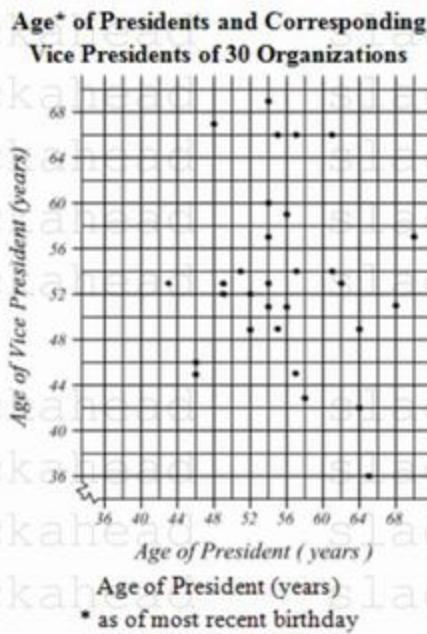
$c > a > b$

Annual Per Capita Consumption of Five Foods in the United States for Selected Years



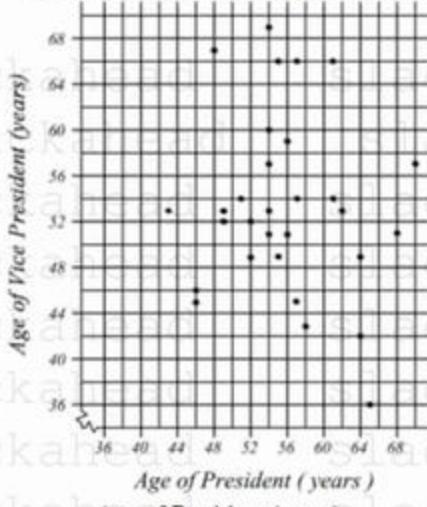


9



10.

Age* of Presidents and Corresponding Vice Presidents of 30 Organizations



What percent of all the presidents and vice presidents are less than 50 years old?

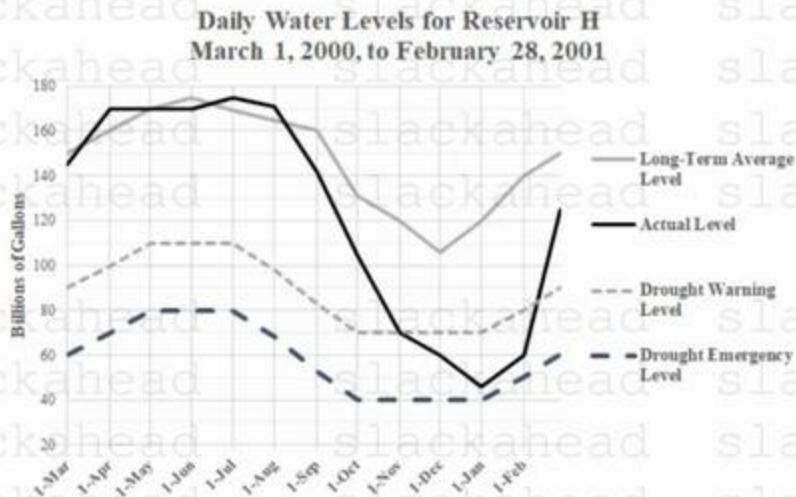
- 10%
 - 15%
 - 20%
 - 25%

Two organizations will be selected at random, one at a time and without replacement, from the 30 organizations. Approximately what is the probability that the age of the vice president of at least one of the two organizations will be at least 1 year greater than the age of the corresponding president?

- 0.35
 - 0.45
 - 0.50
 - 0.55
 - 0.65



Section 11



The time period during which the actual water level was lower than the drought warning water level was approximately what fraction of the one-year period shown?

$\textcircled{O} \frac{1}{6}$

$\textcircled{O} \frac{1}{5}$

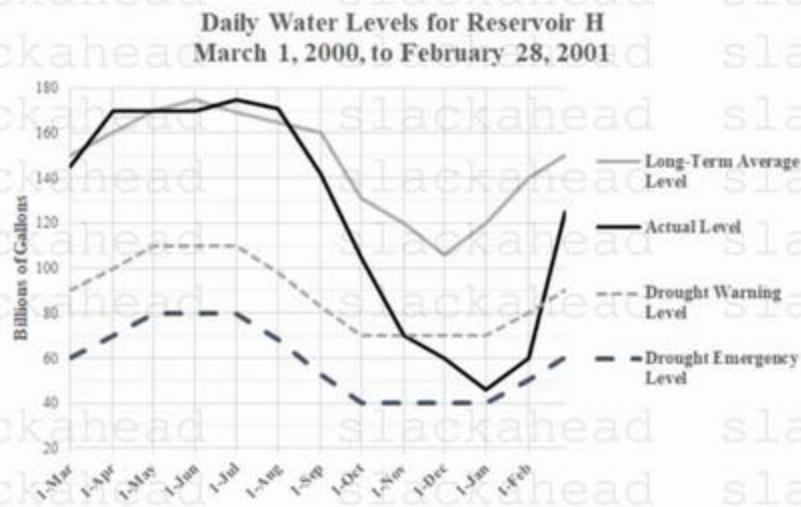
$\textcircled{O} \frac{7}{24}$

$\textcircled{O} \frac{3}{8}$

$\textcircled{O} \frac{5}{12}$



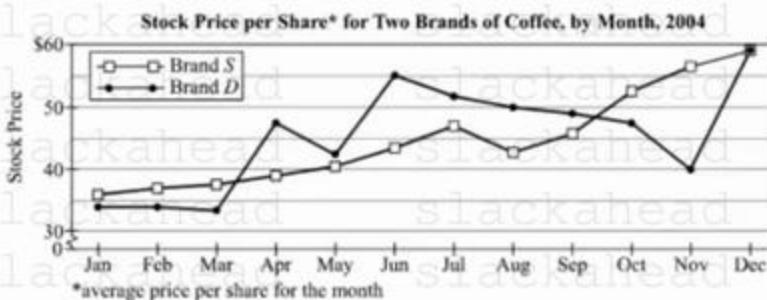
2.



A date is to be selected at random from the 12 dates labeled on the graph. Which of the following is closest to the probability that the actual water level for the date selected will be at least 40 billion gallons greater than the drought warning water level for that date?

- 0.60
- 0.65
- 0.70
- 0.75
- 0.80

3.

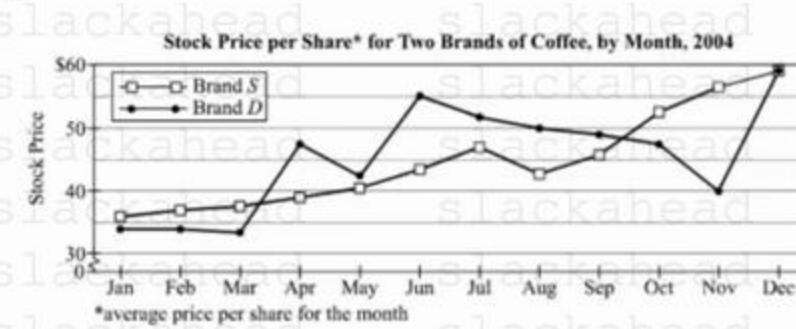


By approximately what percent did the stock price per share of Brand S coffee increase from January to December?

- 25%
- 40%
- 65%
- 150%
- 250%

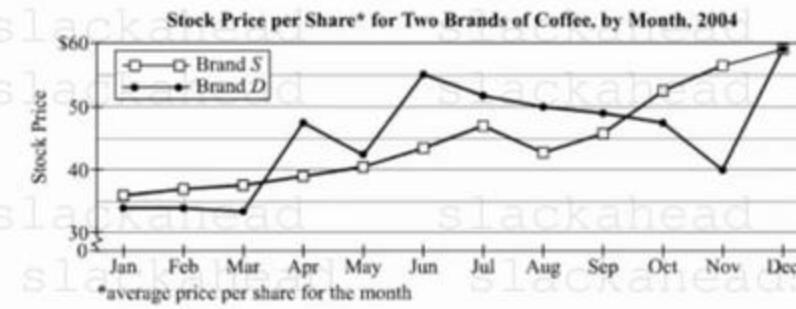


4



*average price per share for the month

5



*average price per share for the month

For each of the 5 months July through November, the stock price per share of Brand D coffee decreased from the price for the preceding month. Which of the following is closest to the average (arithmetic mean) of the 5 decreases in price per share?

- \$1
 \$2
 \$3
 \$4
 \$5

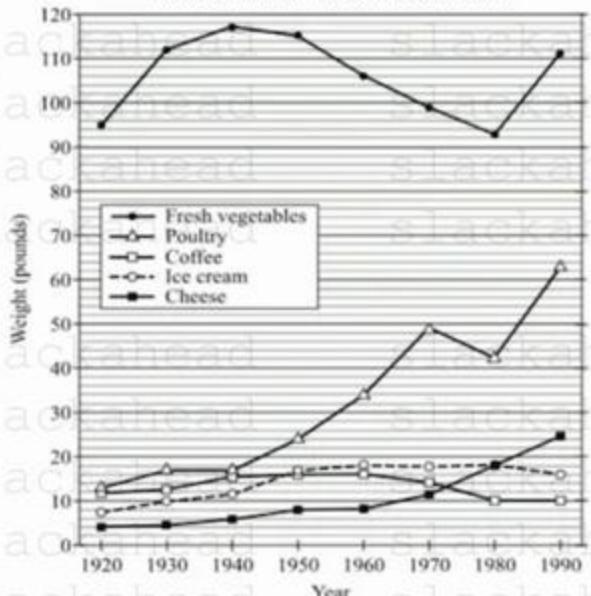
From the graph, Joe read the stock prices for three consecutive months for Brand D coffee. Which of the following is closest to the maximum possible range of the three stock prices that Joe read?

- \$12
 - \$15
 - \$19
 - \$22
 - \$25



6.

Annual Per Capita Consumption of Five Foods in the United States for Selected Years



For which of the first five years shown was the total annual per capita consumption of coffee and ice cream combined closest to the annual per capita consumption of poultry?

○ 1920

○ 1930

○ 1940

○ 1950

○ 1960

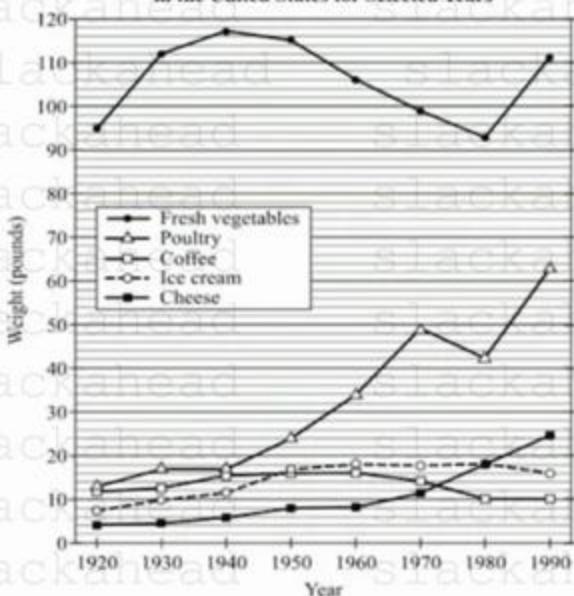
○ 1970

○ 1980

○ 1990

7.

Annual Per Capita Consumption of Five Foods in the United States for Selected Years



The population of the United States was approximately 106 million in 1920 and approximately 249 million in 1990. Based on these population estimates, approximately how many million pounds greater was the total annual consumption of cheese in 1990 than in 1920?

○ 1,000

○ 2,000

○ 4,000

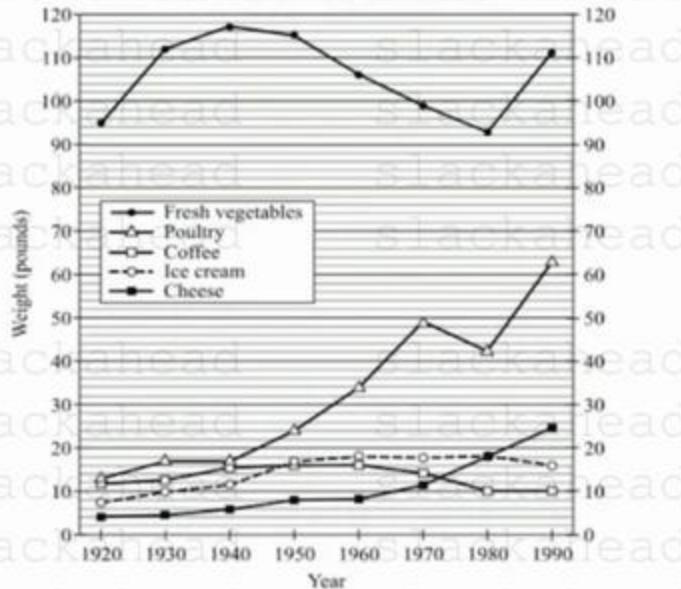
○ 6,000

○ 8,000



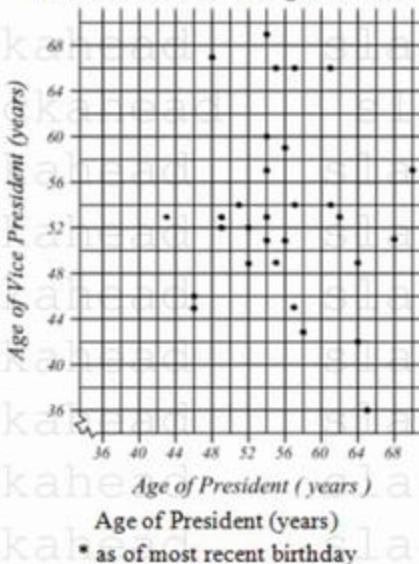
8.

Annual Per Capita Consumption of Five Foods in the United States for Selected Years



9.

Age* of Presidents and Corresponding Vice Presidents of 30 Organizations



* as of most recent birthday

Let a , b , and c represent the ranges of the annual per capita consumption of fresh vegetables, poultry, and ice cream, respectively, for the eight years shown. Which of the following statements is true?

$a > b > c$

$a > c > b$

$b > a > c$

$b > c > a$

$c > a > b$

What percent of all the presidents and vice presidents are less than 50 years old?

10%

15%

20%

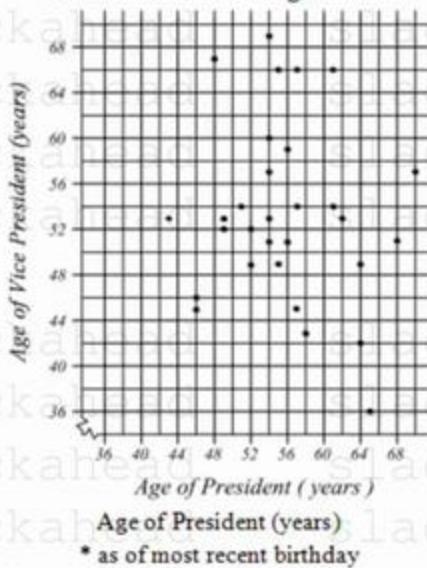
25%

30%



10.

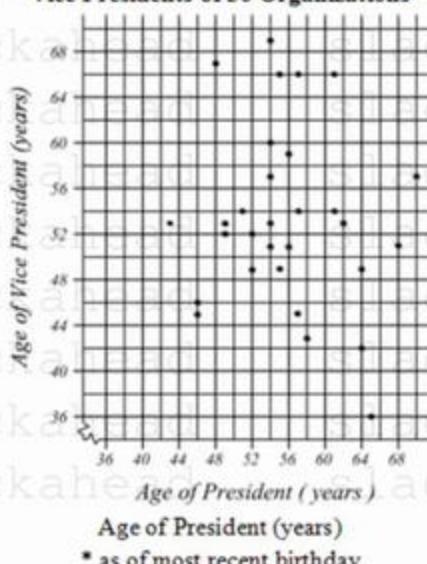
Age* of Presidents and Corresponding Vice Presidents of 30 Organizations



* as of most recent birthday

Section 12

Age* of Presidents and Corresponding Vice Presidents of 30 Organizations



* as of most recent birthday

slackahead

Two organizations will be selected at random, one at a time and without replacement, from the 30 organizations. Approximately what is the probability that the age of the vice president of at least one of the two organizations will be at least 1 year greater than the age of the corresponding president?

0.35

0.45

0.50

0.55

0.65

slackahead

For how many of the organizations does the age of the president exceed the age of the corresponding vice president by 15 years?

None

One

Two

Three

Four

slackahead

slackahead

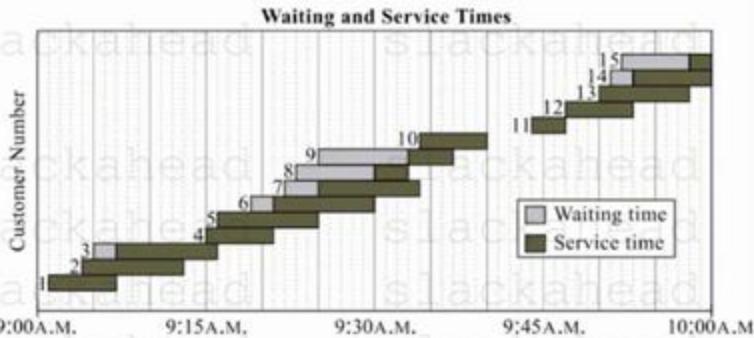
slackahead

slackahead



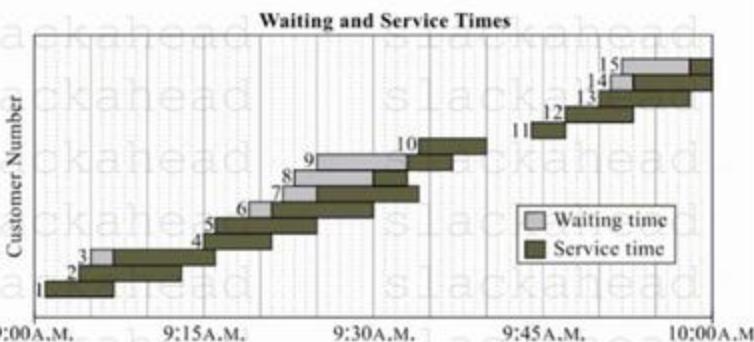
2.

Each of the 15 customers who arrived at a customer service desk between 9 AM and 10 AM was served in order of arrival by one of the two customer service representatives. Each representative served one customer at a time and finished with that customer before serving any other customers. The graph shows the waiting and service times, recorded to the nearest minute, for customers numbered 1 to 15.



3.

Each of the 15 customers who arrived at a customer service desk between 9 AM and 10 AM was served in order of arrival by one of the two customer service representatives. Each representative served one customer at a time and finished with that customer before serving any other customers. The graph shows the waiting and service times, recorded to the nearest minute, for customers numbered 1 to 15.



Of customers 4, 6, 8, 9 and 10, which one was served by the customer service representative who served customer 1?

Customer 4

Customer 6

Customer 8

Customer 9

Customer 10

According to the recorded times, which customer had the greatest ratio of waiting time to service time?

Customer 6

Customer 7

Customer 8

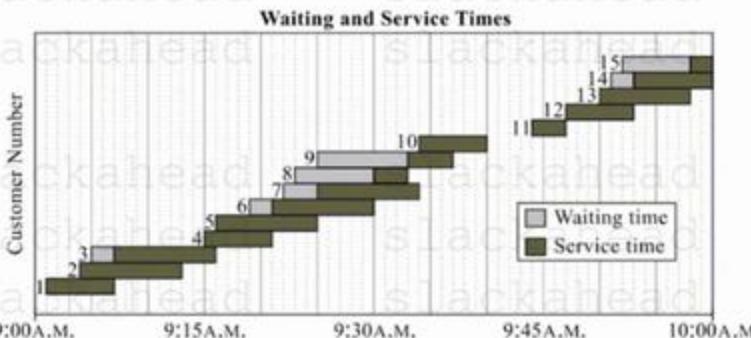
Customer 9

Customer 15



4.

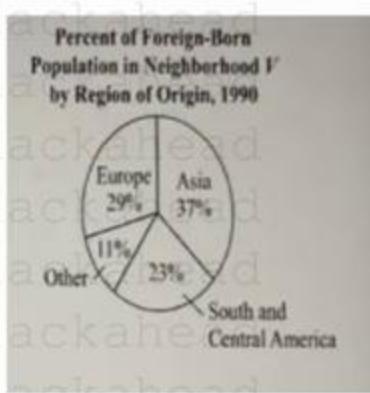
Each of the 15 customers who arrived at a customer service desk between 9 AM and 10 AM was served in order of arrival by one of the two customer service representatives. Each representative served one customer at a time and finished with that customer before serving any other customers. The graph shows the waiting and service times, recorded to the nearest minute, for customers numbered 1 to 15.



5.

Population Data for Five Neighborhoods of City X, 1930 and 1990

Neighborhood	Total Population		Foreign-Born Population	
	1930	1990	1930	1990
R	228,100	217,400	91,200	66,600
S	219,100	100,700	78,700	11,700
T	102,800	150,100	20,200	25,400
U	79,700	47,300	43,100	18,200
V	5,600	9,100	1,700	4,900
Total	635,300	524,600	234,900	126,800



What was the range of the recorded service times, in minutes, for the 15 customers?

4

6

7

9

14

In 1990 in neighborhood V, $\frac{1}{3}$ of the foreign-born population whose region of origin was Asia came from China. Approximately what fraction of the entire foreign-born population in neighborhood V came from China?

$\frac{1}{12}$

$\frac{1}{8}$

$\frac{1}{5}$

$\frac{1}{4}$

$\frac{1}{3}$

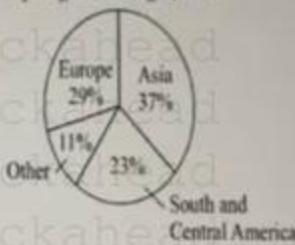


6.

Population Data for Five Neighborhoods of City X, 1930 and 1990

Neighborhood	Total Population		Foreign-Born Population	
	1930	1990	1930	1990
R	228,100	217,400	91,200	66,600
S	219,100	100,700	78,700	11,700
T	102,800	150,100	20,200	25,400
U	79,700	47,300	43,100	18,200
V	5,600	9,100	1,700	4,900
Total	635,300	524,600	234,900	126,800

Percent of Foreign-Born Population in Neighborhood V by Region of Origin, 1990

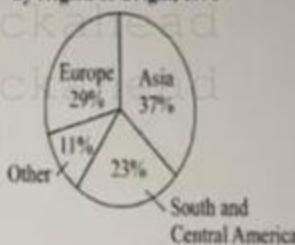


7.

Population Data for Five Neighborhoods of City X, 1930 and 1990

Neighborhood	Total Population		Foreign-Born Population	
	1930	1990	1930	1990
R	228,100	217,400	91,200	66,600
S	219,100	100,700	78,700	11,700
T	102,800	150,100	20,200	25,400
U	79,700	47,300	43,100	18,200
V	5,600	9,100	1,700	4,900
Total	635,300	524,600	234,900	126,800

Percent of Foreign-Born Population in Neighborhood V by Region of Origin, 1990



A list of the names of the people of the entire 1990 foreign-born population in neighborhood V was generated, with each person's name appearing once. The names of 2 different people will be randomly selected from the list. Which of the following is closest to the probability that both names selected will be names of people whose region of origin was "Other"?

0.01

0.11

0.25

0.39

0.49

In 1990 approximately what percent of the total population of neighborhood V was foreign-born with Europe as region of origin?

6%

12%

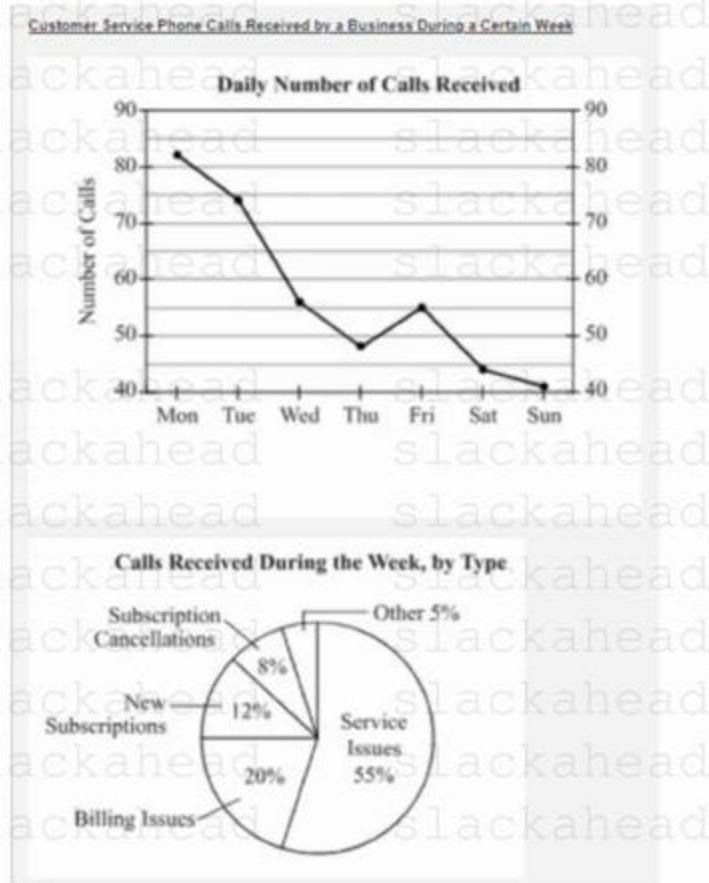
16%

25%

29%



8



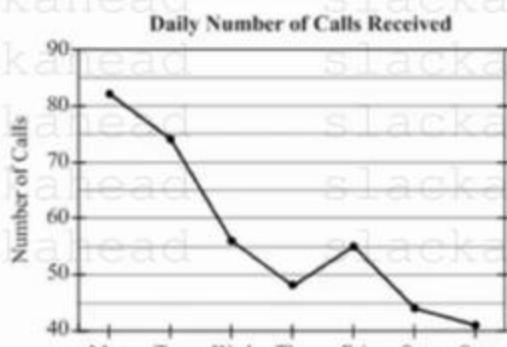
If 50 percent of the calls received during the week about subscription cancellations were received on Friday, approximately what percent of the calls received on Friday were calls about subscription cancellations?

- 60%
 - 40%
 - 30%
 - 20%
 - 4%

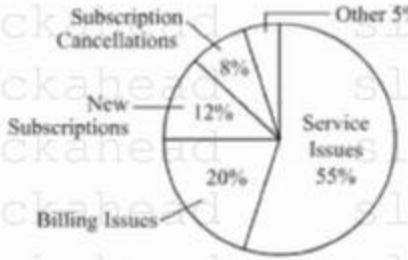


9.

Customer Service Phone Calls Received by a Business During a Certain Week

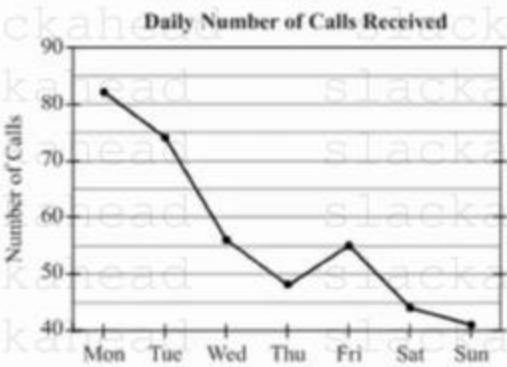


Calls Received During the Week, by Type

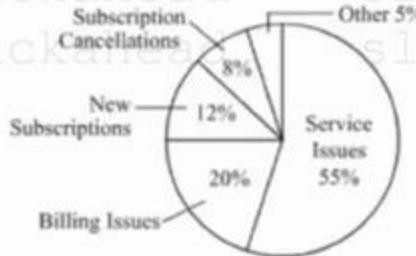


10.

Customer Service Phone Calls Received by a Business During a Certain Week



Calls Received During the Week, by Type



During the week shown, what is the least possible number of days on which the business could have received one or more calls about service issues?

- One
- Two
- Three
- Four
- Five

If a circle graph is to be drawn to show the distribution of the numbers of calls received per day for the week shown, what will be the degree measure of the central angle of the sector representing Thursday?

Give your answer to the nearest degree.

_____ degrees



Section 13

slackahead

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slackahead

1.

The average (arithmetic mean) monthly sales at a certain company for the past k months was m dollars. Which of the following expressions represents the sales, in dollars, for the current month if the average monthly sales for the $k + 1$ months will be 10 percent greater than the average monthly sales for the k months?

slackahead

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slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

 1.1m

slackahead

2.

After taking a quiz, 25 students each received a score on the quiz that was an integer from 1 to 10, inclusive. The average (arithmetic mean) of the 25 scores was 8.8. Only 1 student received the lowest score, and the sum of the 24 scores greater than the lowest score was 217. What was the range of the 25 scores?



3.

slackahead

List S: 1, 2, 3, k, 2k

slackahead

If $k < 2$, which of the following numbers could be the median of the five numbers in list S?slackahead
Indicate all such numbers.

slackahead

 1 2 3 k 2k 4k 6k 9k 15k 24k

slackahead

4.

slackahead

Number of colleges visited

Number of students

0 slackane 4 or more

3 x 24 32 7

The frequency distribution above shows the number of colleges visited by a sample of students. If the median of the numbers of colleges visited is 3, which of the following could be the value of x?

Indicate all such values.

slackaheads slackaheads

slackahead slackahead

slackahead slackahead

slackahead slackahead

 0

slackahead slackahead

 6

slackahead slackahead

 9

slackahead slackahead

 15

slackahead slackahead

 24

slackahead slackahead

 48

slackahead slackahead

 96

slackahead slackahead

 144

slackahead slackahead

 288

slackahead slackahead

 576



5

The median of the n

The average (arithmetic mean) of

7.

slackahead
slackahs
slackin

The boxplot above summarizes a list of 240 numbers. Which of the following statements must be true? Indicate all such expressions.

- The list contains the number 60.
 - The range of the numbers in the list is less than 4 times the interquartile range of the numbers.
 - There were more numbers in the list that are less than 40 than there are numbers that are greater than 70.



8

Larry and Tony work for different companies. Larry's salary is the 90th percentile of the salaries in his company, and Tony's salary is the 70th percentile of the salaries in his company.

Which of the following statements individually provide(s) sufficient additional information to conclude that Larry's salary is higher than Tony's salary?

Indicate all such statements

- The average (arithmetic mean) salary in Larry's company is higher than the average salary in Tony's company
 - The median salary in Larry's company is equal to the median salary in Tony's company
 - The 80th percentile in Larry's company is higher than the 70th percentile salary in Tony's company

9.

The standard deviation of m numerical data $x_1, x_2, x_3, \dots, x_n$, With mean \bar{x} is equal to $\sqrt{\frac{S}{n}}$, where S is the sum of the squared differences $(x_i - \bar{x})^2$, for $1 \leq i \leq n$.

On a certain examination, 7 students received scores of 85, 90, 70, 90, 75, 90, and 95. For the 7 scores, the mode was approximately how many standard deviations above the mean?

A scatter plot with 'slackahead' on both the x-axis and y-axis. The x-axis has tick marks at 0.09, 0.24, 0.59, and 1.69. The y-axis has tick marks at 0.06, 0.09, 0.24, 0.59, and 1.69. Two data points are plotted: one at (0.169, 0.169) and another at (0.59, 0.59).

x	y
0.169	0.169
0.59	0.59

An order for bottles of vitamins from a certain mail order company costs \$12.04 per bottle plus a shipping cost of \$4.80 regardless of the number of bottles ordered. Over the past year, the company has received 100 orders for bottles of vitamins. The standard deviation of the numbers of bottles per order for the 100 orders is 1.5 bottles. What is the standard deviation of the 100 costs for the orders?

S



3.

Year	Annual Revenue (millions of dollars)
2008	6
2009	6
2010	8
2011	13
2012	11
2013	16
2014	14

The table above shows the annual revenues of a company for seven years. Based on the information given, which of the following statements are true for the seven years?

Indicate all such statements.

The average (arithmetic mean) of the revenues was greater than half of the greatest of the revenues.

The median of the revenues was greater than twice the least of the revenues.

The revenue for one of the years after 2008 was more than 60 percent greater than the revenue for the preceding year.

4.

In a list of 25 different numbers, the average (arithmetic mean) of all the numbers greater than the median is 200, and the average of all the numbers less than the median is 100. If the average of the 25 numbers is an integer, which of the following could be the value of the median?

Indicate all such values.

120

125

140

145

160

175

180



5.

In a group of 10 people, the median height is 70 inches, the average (arithmetic mean) height is 70.5 inches, and the range of the heights is 12 inches. If an additional person who is 74 inches tall joins the group, which of the three statistics must change?

- Average only
- Median only
- Range only

- Average and median

- Average and range

6.

For each value x in a list of values with mean m , the absolute deviation of x from the mean is defined as $|x-m|$.

A certain online course is offered once a month at a university. The number of people who register for the course each month is at least 5 and at most 30. For the past 6 months, the mean number of people who registered for the course per month was 20. For the numbers of people who registered for the course monthly for the past 6 months, which of the following values could be the sum of the absolute deviations from the mean?

Indicate all such values.

- 100
- 90
- 60
- 30
- 10



7.

For each value x in a list of values with mean m , the absolute deviation of x from the mean is defined as $|x - m|$.

List W consists of 5 values, all of which are positive integers. The least value in W is 1 and the greatest value in W is 10.

Quantity A

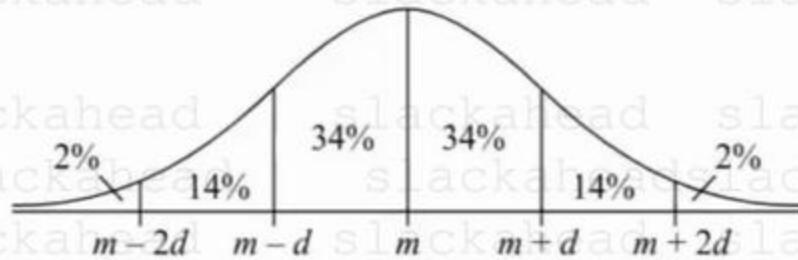
The range of the absolute deviations of the values in W from the mean

Quantity B

5

- Quantity A is greater.
- Quantity B is greater.
- The two quantities are equal.
- The relationship cannot be determined from the information given.

8.



The figure above shows a normal distribution with mean m and standard deviation d , including approximate percents of the distribution corresponding to the six regions shown.

A survey of 5,500 book readers found that the number of books read per year was approximately normally distributed with mean 19.0 and standard deviation 2.0. Which of the following is the best description of the numbers of books read per year by the 880 book readers who read the most books?

- 17 or more books

- 19 to 21 books

- 21 or more books

- 21 to 23 books

- 23 or more books



9

The probability distribution function f of a continuous random variable x is defined by $f(x) = (\frac{2}{13})^x |x|$ for $-3 \leq x \leq 2$.

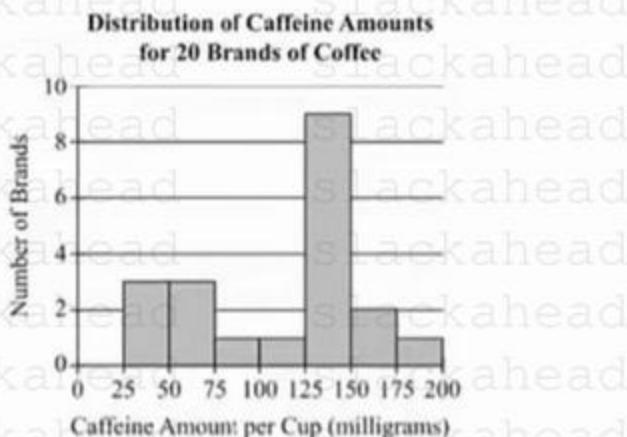
Quantity A

The median of the distribution of X

Quantity B

- 9 -

10.



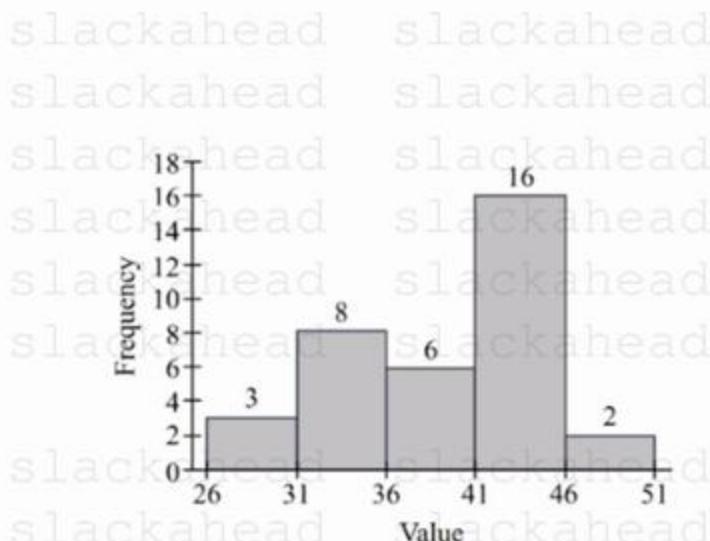
The histogram shows the frequency distribution of caffeine amounts, rounded to the nearest milligram, for 20 brands of coffee, where each interval shown includes its left endpoint and excludes its right endpoint. Based on the histogram, which of the following could be the respective values of the average (arithmetic mean) and the median of the caffeine amounts for the 20 brands?

- 100 and 125
 - 125 and 100
 - 125 and 149
 - 149 and 125
 - 149 and 148



Section 15

1.



Data set D consists of 35 values, all of which are integers. The frequency distribution of the values in D is shown in the histogram, where each interval shown contains values that are greater than or equal to the left endpoint but less than the right endpoint.

Quantity A

The average (arithmetic mean) of the values in D

Quantity B

The median of the values in D

2.

Set S = {2, 4, 6}

Set T = {2, 4, 6, 8, 10, 12}

How many different sets M, other than S and T, can be formed such that S is a subset of M and M is a subset of T?

Three

Four

Six

Nine

Twelve



3.

The candies in a candy shop can be divided into unscented and scented, and they can also be divided into blue and green. There are 1000 unscented candies and 1000 blue candies. 25% of blue candies and 50% of green candies are scented. When the candies which are neither scented blue nor scented green are sold out, how many candies are there still in the shop?

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

4. slackahead

The candies in a candy shop can be divided into unscented and scented, and they can also be divided into blue and green. There are 1000 unscented candies and 1000 blue candies. 25% of blue candies and 50% of green candies are scented. When the candies which are neither scented blue nor scented green are sold out, how many candies are there still in the shop?

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

5.

slackahead slackahead slackahead slackahead Of the people in a debating club, 42 percent are more than 55 years old and 68 percent are married.

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

Quantity A

The percent of the people in the club who are both
more than 55 years old and married

Quantity B

26%

6.

In a poll of 200 people who answered either yes or no to each of two questions, 170 people answered yes to the first question and 100 people answered yes to the second question. Which of the following could be the number of people polled who answered no to both questions?

slackahead slackaheads slackahead Indicate all such numbers.

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead 15 slackahead slackahead slackahead slackahead

slackahead 18 slackahead slackahead slackahead slackahead

slackahead 20 slackahead slackahead slackahead slackahead

slackahead 26 slackahead slackahead slackahead slackahead



7.

slackahead

slackahead

slackahead

slackahead

A college professor took attendance for the first 10 days of a class last semester. The professor noticed that Sarah attended class on 8 of those days, Andrew attended class on 7 of those days, Jeff attended class on 6 of those days, and on only 1 of those days did all three students attend class. On how many of the 10 days did at least two of the three students attend class?

slackahead _____ days

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

slackahead

8.

slackahead

slackahead

slackahead

slackahead

All of the 80 science students at a certain school are enrolled in at least one of three science courses: biology, chemistry, and physics.

There are 60 students enrolled in biology, 50 students enrolled in chemistry, and 35 students enrolled in physics. None of the students are enrolled in all three courses. Which of the following could be the number of students enrolled in both chemistry and physics?

Indicate all such numbers.

slackahead

 0

slackahead

slackahead

slackahead

slackahead

 5

slackahead

slackahead

slackahead

slackahead

 10

slackahead

slackahead

slackahead

slackahead

 15

slackahead

slackahead

slackahead

slackahead

 20

slackahead

slackahead

slackahead

slackahead

 25

slackahead

slackahead

slackahead

slackahead

 30

slackahead

slackahead

slackahead

slackahead

 35

slackahead



Section 16

slackahead

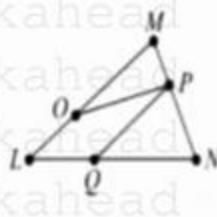
slackahead

slackahead

slackahead

slackahead

slackahead



slackahead

The figure above represents a game board with a chip at starting point M. On successive plays, the chip may be moved along the lines from one labeled point to an adjacent labeled point, but may not be moved to the same point twice. Along how many different paths can the chip be moved from M to N in this game?

slackahead

How many different points (x, y) , where x and y are both positive integers, in xy -plane satisfy the inequality $x+y \leq 200$?

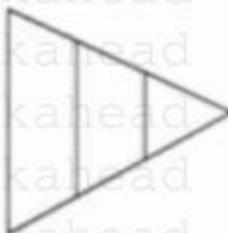
2.

slackahead



3.

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead



slackahead
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slackahead
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slackahead
slackahead
slackahead

A banner is to be designed to have 3 regions of solid color, as shown. Colors can be repeated, but no 2 adjacent regions can have the same color. How many different designs are possible if the colors are chosen from blue, green, red, white, and yellow?

slackahead
slackahead
slackahead
slackahead
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slackahead
slackahead
slackahead
slackahead

slackahead
slackahead
slackahead
slackahead 20
slackahead 36
slackahead 60
slackahead 72
slackahead 80
slackahead

slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead
slackahead

slackahead
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slackahead

4.

slackahead
slackahead
How many 6-digit integers greater than 321,000 can be formed such that each of the digits 1, 2, 3, 4, 5, and 6 is used once in each
6-digit integer?

slackahead
slackahead
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slackahead
slackahead

5.

If a set S has a total of 6 subsets that consist of 2 members each, then S consists of how many members?

slackahead
slackahead
slackahead

slackahead
slackahead
slackahead
slackahead

slackahead
slackahead
slackahead
slackahead



6.

Darrell has a collection of 40 DVDs, each of which contains one movie. There are 17 comedy movies, 14 fantasy movies, and 9 historical movies, where each historical movie takes place in a separate time period. The movies will be ordered on a shelf from left to right so that the movies of each type comedy, fantasy and historical are in a single group of consecutive movies. In addition, the historical movies will be ordered from earliest time period to latest time period. How many possible orderings of the movies are there?

- slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead (17!)(14!)(3!)
slackahead slackahead (17!)(14!)(9!)

- slackahead slackahead slackahead
slackahead slackahead (40!)
slackahead slackahead (17!)(14!)
slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead

7.

An urn contains 4 red balls, 8 green balls and 2 yellow balls. Five balls are randomly selected WITH replacement from the urn.

What is the probability that 1 red ball, 2 green balls, and 2 yellow balls will be selected?

Give your answer as a fraction.

- slackahead slackahead slackahead
slackahead slackahead
slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead
slackahead slackahead slackahead

8.

Two seating arrangements of people around a circular table are called the same if, for each seated person, the same person is seated to that person's immediate right in both arrangements.

Quantity A

The number of different seating arrangements of 4
people around a circular table

Quantity B

slackahead slackahead slackahead slackahead slackahead

8



2.

slackahead

slackahead

slackahead

slackahead

Five gift cards will be distributed among 10 people so that no person receives more than one gift card. The gift cards consist of one \$100 gift card, one \$50 gift card, one \$25 gift card and two \$10 gift cards. How many different distributions of the five gift cards among the 10 people are possible if the two \$10 gift cards are considered to be identical?

slackahead

3.

slackahead

slackahead

slackahead

slackahead

0 1 1 1 1 1 1 1 1 1

0 0 1 1 1 1 1 1 1 1

0 0 0 1 1 1 1 1 1 1

0 0 0 0 1 1 1 1 1 1

0 0 0 0 0 1 1 1 1 1

0 0 0 0 0 0 1 1 1 1

0 0 0 0 0 0 0 1 1 1

0 0 0 0 0 0 0 0 1 1

0 0 0 0 0 0 0 0 0 1

0 0 0 0 0 0 0 0 0 0

The table above consists of 10 rows and 10 columns. Each entry in the table is either a zero or a one. A zero is to be selected at random from the table. What is the probability that the zero selected will be in a row with an odd number of zeros and in a column with an odd number of zeros?

slackahead

slackaheads

slackahead

slackahead

Give your answer as a fraction.



4.

The vehicles of Company W are numbered consecutively from 1 to 650. The vehicles with a number that ends with one of the digits 1, 2, 3, 4, or 5 are used by Division 1. Vehicles with a number between 130 and 389, inclusive, are trucks. What percent of the company vehicles are trucks used by Division 1?

10%

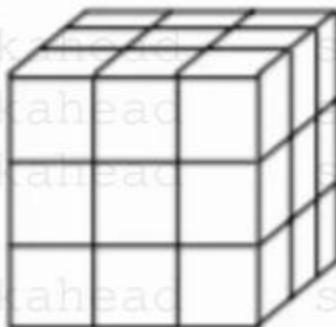
20%

30%

40%

50%

5.



If 20 red cubes and 7 white cubes, all of equal size, are fitted together to form one large cube, as shown above, what is the greatest fraction of the surface area of the large cube that could be red?

$\frac{8}{9}$

$\frac{47}{54}$

$\frac{23}{27}$

$\frac{5}{6}$

$\frac{20}{27}$



6.

If one number is chosen at random from the first 1,000 positive integers, what is the probability that the number chosen has at least one digit with the number 6?
Give your answer as a fraction.

7.

Three coins--two 10-cent coins and one 5-cent coin--are to be flipped simultaneously. For each of the three coins, the probability that the coin will land heads up is $\frac{1}{2}$. What is the probability that the total value of the coins that will land heads up is 15 cents?
Give your answer as a decimal.

8.

On a 60-question true-false test, Marcy answered correctly all questions she understood, and she guessed randomly on all questions she did not understand. She answered 52 questions correctly on the test. How many questions did Marcy most likely understand?

slackahead
slackahead

slackahead
slackaheads

slackahead
slackahead

slackahead
slackahead
slackahead
9.
slackahead
A telephone system has n telephone lines. For each of the n lines, the event that the line will fail during a certain reliability test has probability 0.3, and these n events are independent. If the probability that at least one of the n lines will not fail during the reliability test is greater than 0.99, what is the minimum value of n ?

slackahead
slackahead
slackahead

slackahead
slackahead
slackahead

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slackahead

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slackahead
slackahead
slackahead
slackahead

slackahead
slackahead
slackahead

○⁴

○⁵



10.

slackahead

Quantity A

The probability that neither R nor T will occur

slackahead

THE END

slackahead

slackahead

slackahead

slackahead

slackahead

slackaheads

slackahead



Answers

Math Sprint Practice

Section 1 Medium

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	A	C	B	D	D	D	A	E	E	C	D	23/30	B	A	C	56	C	E	E

Section 2 Hard

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	A	A	D	C	C	D	B	B	E	D	C	36	E	D	A	3	A	E	A, B, C, E

Section 3 Research

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
C	B	B	D	B	C	B	B	E	B	D	A	-4	C	E	1500	504	C	B	A, B, G, H

Section 4 Medium

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
C	C	B	D	B	D	B	B	C	B	C	D	30	E	E	C	15	B	B	A, B

Section 5 Hard

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	B	D	B	D	D	C	C	C	E	B	E	A	D	B	A	200	A, E, F	E	B, G, H



Section 6 Medium

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
C	B	A	B	D	A	A	D	B	C	D	D	1.72	E	B	D	54	D	B	B

Section 7 Hard

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	D	C	A	D	D	B	D	C	E	C	B	D	C	E	D	20.25	B	A,B,D	B,C,D,E

Section 8 Medium

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	A	C	D	B	C	C	D	B	A,C	C	C	64	E	D	D	12	D	D	E

Section 9 Hard

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	D	D	C	A	C	A	B	E	C,D,E,F	D	B	B,F	C	E	B	-2	E	A	E

Section 10 Medium

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	C	B	A	B	D	D	C	D	C	A	D	5.2	B	C	D	41	D	D	C,D,E

Section 11 Hard

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	B	D	D	D	C	B	C	B	C	B	A	A	D	B	C	15	C	D	A



Section 12 Medium

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
C	D	A	A	C	D	C	C	E	D	E	C	10	C	D	D	25	B,C	B	D

Section 13 Hard

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	C	A	B	D	D	B	A	C	B	B	C	16	B	18	B	7/12	A	A,B,C	B

Section 14 Research

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	B	A	A	B	B	B	B	48	A	B,C	A	72	E	B	A,B	1200	B	D	D

Section 15 Medium

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
D	A	A	C	C	A	A	C	C	E	C	C	0.25	C	C	E	25	E	A	E,F

Section 16 Hard

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	A	A	C	C	D	D	B	C	A	E	B	15	D	B	C	-4/39	D	A	E

Section 17 Research

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	B	A	B	D	A	A	D	A,C	B	B	E	78	B	A	69	7	E	A	D



Section 18 Medium

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	B	B	D	B	A	A	D	D	C	E	A	9	D	B	A	5	D	B,C	E

Section 19 Hard

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	C	D	D	D	A	C	B	A	C	C	A	A	C	D	E	60	D	4	A,B,D

Section 20 Medium

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	D	A	C	C	C	D	C	5328	E	C	4	0.7	C	C	E	150	E	E	C

Section 21 Hard

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	C	C	D	B	D	C	E	D	D	160	A	A,B	A	E	C	6	A	5	A

Section 22 Medium

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	C	C	D	C	A	C	D	E	A	D	E	39	A	E	B	72	C	A	A,D

Section 23 Hard

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	A	C	C	C	D	D	D	A	9	B	E	18	1	A	C	350	D	D	A,B,C


Section 24 Research

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	D	A	B	A	B	A	C	C	A,B	A	E	5	B	E	3/8	60	A	A	D

Section 25 Research

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
C	D	D	B	C	B	C	C	A,D	D	E	E	7	B	E	D	24/50	A	C	E

Special exercises by test point

slackahead	slackahead	1.1.1	slackahead	slackahead
slackahead	slackahead	2	slackahead	3
slackahead	slackahead	D	slackahead	C

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	1.1.1	slackahead
slackahead	slackahead	3	slackahead
slackahead	C,D,E	D	B

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	1.1.3	slackahead
slackahead	slackahead	2	slackahead
56	slackahead	76	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	1.2.1	slackahead
1	2		
D	D		



1.2.2			
1	2	3	
B	C	C	

		1.3.1	
1	slackahead	2	slackahead
-3	slackahead	A	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	1.3.2	slackahead
1	slackahead	2	slackahead
A	slackahead	C	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	1.3.3	slackahead
1	slackahead	2	slackahead
36	slackahead	B	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	1.4.1	slackahead
slackahead	slackahead	1	slackahead
slackahead	slackahead	A	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

1.4.2		
1	2	3
D	D	D



slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	1.4.3
1 slackahead	slackahead	2 slackahead	slackahead
C slackahead	slackahead	A slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

1.4.4

slackahead	2 slackahead	3 slackahead	4 slackahead
E slackahead	C slackahead	B slackahead	A, C slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

1.5.1

slackahead	2 slackahead	3 slackahead	4 slackahead
slackahead	C slackahead	B slackahead	C slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

1.5.2

slackahead	2 slackahead	3 slackahead	4 slackahead
1 slackahead	B slackahead	B slackahead	E slackahead
C slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

1.5.2

slackahead	2 slackahead	3 slackahead	4 slackahead
C slackahead	B slackahead	B slackahead	E slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

1.6.1

1	2
A, B, C, E, F	A, B, C



slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	1.6.2	slackahead
1 slackahead	sla	2 kahead	slackah	3 ad
C ackahead	sla	D kahead	slackah	E ad
slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead

1.6.3

slackahead	sla	2 kahead	slackah	3 ad
A slackanead	sla	A, D kahead	slackan	E ad
slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead

1.6.4

slackahead	sla	2 kahead	slackah	3 ad
A slackanead	sla	4 kahead	slackah	D ad
slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead

1.6.4

slackahead	slackahead	slackahead	slackahead	slackahead
1 slackahead	slackahead	2 slackahead	slackahead	slackahead
A, B, C, D slackahead	slackahead	C slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead

1.7.1

slackahead	slackahead	slackahead	slackahead	slackahead
1 slackahead	slackahead	2 slackahead	slackahead	slackahead
C slackahead	slackahead	C slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead

1.7.2

1

B



slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	1.8.1	slackahead
slackahead	slackahead	1	slackahead
slackahead	slackahead	C	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

1.8.2

1 slackahead	2 slackahead	3 slackahead	4	slackahead
48 slackahead	C slackahead	D slackahead	C	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	1.8.3	slackahead	slackahead
1 ackahead	slakkahead	slackah	3 ad	slackahead
E slackanead	slakkanead	slackan	E ad	slackanead
slackahead	slackahead	slackahead	slackahead	slackahead

1.8.4

1 slackanead	2 slackanead	3 slackanead	4 slackanead	5 slackanead
E slackanead	C slackanead	C slackanead	1 slackanead	B slackanead
slackanead	slackanead	slackanead	slackanead	slackanead
slackahead	slackahead	slackahead	slackahead	slackahead

1.8.5

1 slackanead	2 slackanead	3 slackanead	4 slackanead
B slackanead	D slackanead	B slackanead	16 slackanead
slackanead	slackanead	slackanead	slackanead
slackahead	slackahead	slackahead	slackahead

1.8.6

1	2	3
C	A	5



2.1.1

slackahead	slackahead	slackahead	slackahead	slackahead
1 slackahead	sla kahead	2 slackahead	slackah ad	3 slackahead
100 slackahead	sla D kahead	D slackahead	slackah ead	3 / 8 slackahead

slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	2.1.2	slackahead	slackahead

1

slackahead	slackahead	C slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	2.1.3	slackahead	slackahead
1 slackahead	sla 2 kahead	2 slackah ad	3 sad	slackahead
B ackahead	sla C kahead	C slackah ad	D dad	slackahead

slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead

2.1.4

1 slackahead	slackahead	2 slackahead	slackahead	slackahead
B lackahead	slackane d	D slackahead	slackanead	slackanead

slackanead	slackanead	slackanead	slackanead	slackanead
slackahead	slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	2.2.1	slackahead	slackahead
slackahead	slackanead	2	slackahead	slackahead
E ackahead	slackanead	14 / 33	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackanead	slackahead	slackahead	slackahead

slackahead	slackahead	2.2.2	slackahead	slackahead
slackahead	slackanead	1	slackahead	slackahead
		D		



2.2.3

1

D

2.3.1

1

E

2

D

3

E

2.3.2

1

B

2

D

2.3.3

1

3

2

A

2.3.4

1

E

2.4.1

1

E

2

B

3

C



2.4.2

slackahead	slackahead	slackahead	slackahead
1	slackahead	2	slackahead
50	slackahead	30	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	2.4.3	slackahead

1		2	
C	slackahead	B	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	2.4.4	slackahead
slackahead	slackahead	1	slackahead

slackahead	slackahead	A , B , C	slackahead
slackahead	slackahead		slackahead

slackahead	slackahead		slackahead
slackahead	slackahead		slackahead

2.5.1

1	slackahead	2	slackah	3	ad	slackahead
A	slackahead	87120	slackah	slackane	B	slackanead

slackanead	slackanead	slackanead	slackanead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	2.5.2	slackahead
slackanead	slackanead		slackanead

1	slackanead	2	slackahead	slackahead
B	slackanead	D	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	2.5.3	slackahead
slackahead	slackahead		slackahead

1	2	3
55	700/3	60



2.5.4

1

A

2.5.5

1

D

2.5.6

1

D

2.5.7

1

A

2.5.8

2

D

2.5.9

1

63



slackahead	slackahead	slackahead	slackahead
1	slackahead	2	slackahead
C	slackahead	A	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
2.5.10			slackahead

1	slackahead	2	slackahead
45	slackahead	200	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
3.1.1			slackahead

1	slackahead	2	slackahead	3	slackahead
B	slackahead	D	slackahead	A	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	3.1.2	slackahead	slackahead
1	slackahead	sl	2	ckaheads slackahe
E	slackahead	sla	C	ckahead slackahad

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	3.1.3	slackahead	slackahead
1	slacka	2	3	slackahead
A	slacka	B	D	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	3.2.1	slackahead	slackahead
1		2		
C		A		



slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	1	slackahead
slackahead	slackahead	A	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

3.2.3

slackahead	slackahead	1	slackahead
slackahead	slackahead	C	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	3.2.4	slackahead
1 slackahead	slackahead	2	slackahead
C ackahead	slackahead	A	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	3.2.5	slackahead
1 slackahead	sl	2	slackaheads
A slackanead	sl	501	slackan

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	3.3.1	slackahead
1 slackanead	slackanead	2	slackanead
B slackahead	slackahead	A	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
3.3.2			
1	2		

D	C		
---	---	--	--



slackahead	slackahead	slackahead	slackahead
1	slackahead	2	slackahead
17	slackahead	A, B	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	1	slackahead
slackahead	slackahead	A	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	3.4.2	slackahead

1	slackahead	2	slackahead
5	slackahead	C	20

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
1	slackahead	2	slackahead

9	slackahead	slackahead	-1
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	3.5.1	slackahead
1	slackahead	2	slackahead

D	slackahead	D	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	3.5.2	slackahead
1	2	3	4

D	B	A	D
slackahead	slackahead	slackahead	slackahead



3.5.3

slackahead	slackahead	slackahead	slackahead
1 slackahead	slackahead	2 slackahead	slackahead
D, E slackahead	slackahead	B, C, D slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	3.5.4	slackahead

1		2	
D slackahead	slackahead	C slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	3.6.1	slackahead
1 slackahead	slackahead	2	slackahead
-0.5 slackahead	slackahead	B	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

3.6.2

1 slackahead	slackahead	2	slackahead
C lackahead	slackaheads	A	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	3.6.3	slackahead
1 slackahead	slackahead	2	slackahead
C ackahead	slackahead	A	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	3.7.1	slackahead
1 slackahead	slackahead	2	slackahead
A		-4 / 39	



3.7.2

slackahead	slackahead	slackahead	slackahead	slackahead
1 slackahead	sla	2 kahead	slackahad	3
A slackahead	sla	A kahead	slackahad	11 / 3

slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead

3.7.3

slackahead	slackahead	slackahead	slackahead	slackahead
1 slackahead	sla	2 kahead	slackahad	3
E slackahead	sla	A kahead	slackahad	C ad

slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead

3.7.4

slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead
1 slackahead	slackahead	2	slackahead	slackahead
B		10		slackahead

slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	3.7.5	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	1	slackahead	slackahead
slackahead	slackahead	B	slackahead	slackahead

3.7.6

slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead
1 slackahead	slackahead	2	slackahead	slackahead
C	slackahead	B, D	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead
1		2		

slackahead	slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead	slackahead
C	slackahead	D	slackahead	slackahead



slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

3.7.8

1

2

E

A, B, D

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

3.7.9

1

2

D

B, E

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

4.1.1

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

4.1.2

1

2

C

B

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

4.1.3

1

2

B

A, C

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

4.2.1

1

B



slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	1	slackahead
slackahead	slackahead	C	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	1	slackahead
slackahead	slackahead	B	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	4.2.4	slackahead

1	2	3	
slackahead	slackahead	slackahead	slackahead
C	E	D	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	1	slackahead
slackahead	slackahead	A	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	1	slackahead
slackahead	slackahead	A	slackahead
1	2	slackahead	slackahead
B	A	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
4.3.2			

1	2
B , C , D	A



slackahead slackahead slackahead slackahead 4.3.3

1	slackahead	slackahead	2	slackahead	slackahead
C	slackahead	slackahead	A	slackahead	slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead 4.3.4

1	2	3	4	slackahead	slackahead
A	D	slackahead	A	slackahead	D

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead 4.3.5

1	2	slacka	3	slacka	4	5	slackahead
A	D	slacka	B	slacka	A	C	slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

4.3.6

1	slackahead	slackahead	2	slackahead	slackahead
A	slackahead	slackaheads	C	slackahead	slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead 4.3.7

1	slackahead	slackahead	2	slackahead	slackahead
B	slackahead	slackahead	B	slackahead	slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead

slackahead slackahead slackahead slackahead 4.3.8

1	2	3	slackahead	slackahead
B	E	C	slackahead	slackahead



slackahead	slackahead	slackahead	slackahead
1	slackahead	2	slackahead
D	slackahead	35	slackahead

4.4.1

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

4.4.2

slackahead	slackahead	2	slackahead
B	slackahead	E	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

4.4.3

slackahead	slackahead	2	slackahead
32	slackahead	D	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

4.4.4

slackahead	slackahead	2	slackahead
A	slackahead	D	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

4.5.1

slackahead	slackahead	2	slackahead
B	slackahead	A	slackahead

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

4.5.2

slackahead	slackahead	3	slackahead
B	2	C	slackahead



slackahead slackahead slackahead 4.5.3

1 slackahead

slackahead

slackahead 2

slackahead

B slackahead

slackahead

slackahead D

slackahead

slackahead slackahead

slackahead slackahead

slackahead slackahead

slackahead slackahead

slackahead slackahead 4.5.4

1 slackahead

2

C slackahead

slackahead B

slackahead slackahead

slackahead slackahead

slackahead slackahead

slackahead slackahead

slackahead slackahead

slackahead slackahead 4.5.5

1 slackahead slackahead

2

D slackahead slackahead

slackahead B

slackahead slackahead

slackahead slackahead

slackahead slackahead

slackahead slackahead

slackahead slackahead

4.5.6

1 slackahead slackahead

2

E slackahead slackaheads

slackahead C

slackahead slackahead

slackahead slackahead

slackahead slackahead

slackahead slackahead

slackahead slackahead

slackahead slackahead 4.5.7

1 slackahead slackahead

2

A slackahead slackahead

slackahead 24

slackahead slackahead

slackahead slackahead

slackahead slackahead

slackahead slackahead

slackahead slackahead

slackahead slackahead 4.6.1

1 slackahead 2 slackahead

slackahead 3 slackahead

slackahead 4 slackahead

B B

6

A



4.6.2

slackahead	slackahead	slackahead	slackahead
1	2	3	
D	D	40 / 7	

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

4.6.3

	1		
slackahead	slackahead	slackahead	slackahead
slackanead	slackanead	slackanead	slackanead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
1	2		

C	slackahead	D	slackahead
slackanead	slackanead	slackanead	slackanead
slackahead	slackahead	slackahead	slackahead

4.6.4

4.6.5			
1	2	slackahead	slackahead
C	slackaheads	A	slackahead

slackanead	slackanead	slackanead	slackanead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

5.1.1			
1	2	slackahead	3
D	C	slackahead	D

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

5.1.2			
1	2	slackahead	3
B	E		3 / 8



5.1.3

slackahead	slackahead	slackahead	slackahead
1	2	3	
B	D	C	

slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead

5.1.4

slackahead	slackahead	slackahead	slackahead
1	2	3	
C	C	C	

slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead

5.1.5

slackahead	slackahead	slackahead	slackahead
1	2	3	
D	E	C	

slackahead	slackahead	slackahead	slackahead
1	2	3	
E	E	C	

slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead

5.1.7

slackahead	slackahead	slackahead	slackahead
1	2	3	
C	D	43	

slackahead slackahead slackahead slackahead
slackahead slackahead slackahead slackahead

5.2.1

1	2
D	A, C, D



slackahead	slackahead	slackahead	slackahead
5.2.2			

1	slackahead	slackahead	slackahead
E	slackahead	slackahead	C, D

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
5.2.3			

1	slackahead	slackahead	slackahead
C	slackahead	slackahead	A

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
5.2.4			

1	slackahead	slackahead	slackahead
B	slackahead	slackahead	C

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
5.2.5			

1	slackahead	slackahead	slackahead
E	slackahead	slackahead	E

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
5.2.6			

1	slackahead	slackahead	slackahead
4	slackahead	slackahead	B

slackahead	slackahead	slackahead	slackahead
slackahead	slackahead	slackahead	slackahead

slackahead	slackahead	slackahead	slackahead
5.2.7			

1	slackahead	slackahead	slackahead
D	slackahead	slackahead	C



slackahead 5.2.8

1	2	3	4	5	6	7
D	B	B	A	B	E	B

slackahead 5.2.9

1

A, D

5.3.1

1

1.72

5.3.2

1

C

5.3.3

1

A

6.1.1

1

A





6.2.3

1

A, F, G

6.3.1

1

E

6.3.2

1

A

6.3.3

1

456

6.3.4

1

9

6.3.5

1

D



6.4.1

1

3 / 11

6.4.2

1

2 / 9

6.4.3

1

D

6.4.4

1

E

6.4.5

1

A

Math latest 170 puzzles**Section 1**

1	2	3	4	5	6	7	8	9	10
A, B	D	C, F	D	B, G, H	B, C, G	A	A, F, G	C	A, C



Section 2

1	2	3	4	5	6	7	8	9	10
D	D	18	A	48	E	E	D	E	E

Section 3

1	2	3	4	5	6	7	8	9	10
B	16	26	B	D	B	A	B	C	45

Section 4

1	2	3	4	5	6	7	8	9	10
B	B	29.4	B	A, B, C	87120	B	7.8	B, C	B

Section 5

1	2	3	4	5	6	7	8	9	10
D	C	200	B	D	D	B	12	B	C

Section 6

1	2	3	4	5	6	7	8	9	10
D	E	B	-7	B, E	A	4	D	E	A

Section 7

1	2	3	4	5	6	7	8	9	10
B	D, E, F	C	B	B	E	E	D	A	A

Section 8



1	2	3	4	5	6	7	8	9	10
12	C	20	237600	E	A	D	C	D	B

Section 9

1	2	3	4	5	6	7	8	9	10
D	C	C	C	D	D	E	D	D	C

Section 10

1	2	3	4	5	6	7	8	9	10
D	A, B, C	D	B	C	B	E	A	B, C	A

Section 11

1	2	3	4	5	6	7	8	9	10
C	A	C	C	C	E	D	C	D	E

Section 12

1	2	3	4	5	6	7	8	9	10
C	E	E	S	C	B	A	C	C	D

Section 13

1	2	3	4	5	6	7	8	9	10
43	E	E	S	C	B	A	C	C	D

Section 14



1	2	3	4	5	6	7	8	9	10
C	C, D	A, C	B, F	A	C, D, E	D	C	A	A

Section 15

1	2	3	4	5	6	7	8	9	10
B	C	350	500	D	C, D	10	B, C, D, E	A, B, C, D, E	B

Section 16

1	2	3	4	5	6	7	8	9	10
C	19900	E	456	4	A	960 / 16807	B	A	C

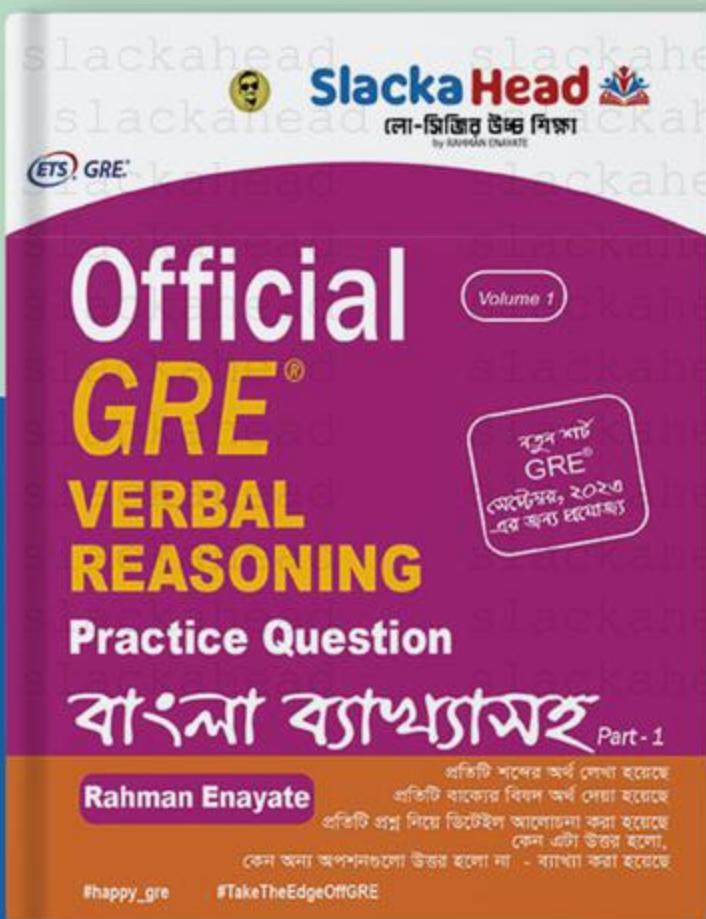
Section 17

1	2	3	4	5	6	7	8	9	10
D	15120	2 / 11	B	A	271 / 1000	0.25	44	D	B

Official GRE® VERBAL REASONING Practice Question

বাংলা ব্যাখ্যাসহ (Part-1)

নতুন শর্ট GRE®
সেপ্টেম্বর ২০২৩
এর জন্য প্রযোজ্য



Rahman Enayate
GRE® Score: 328/340
IELTS Band Score: 8.0

- ★ প্রতিটি শব্দের অর্থ লেখা হয়েছে
- ★ প্রতিটি বাক্তার বিষদ অর্থ দেয়া হয়েছে
- ★ প্রতিটি প্রশ্ন নিয়ে ভিটেইল আলোচনা করা হয়েছে
- ★ কেন প্রটো উত্তর হলো, কেন অন্য অপশনগুলো উত্তর হলো না - ব্যাখ্যা করা হয়েছে