Stay hungry, stay foolish.

姓名：

微臣教育 **GRE** 数学讲义使用说明

微臣教育 GRE 数学讲义一共包含 4 个部分：算数，代数，集合和数据分析，这 4 个部分基于对官方指南中的 GRE 数学部分进行深度分析，为大家提炼知识。

讲义中的题目包括以下来源：

- 新 GRE 官方 OG；
- 新 GRE 官方新 150 题；
- 猴哥 112 难题;
- 自编和改编题。

课程中我们会讲练搭配，带领同学们全面快速回顾数学考点，将重点、难点进行分析，指明易错点，详解做题技巧，为冲刺 GRE 数学满分 170 助力。

目录

GRE 数学基本概述

2011 年 GRE 考试全面实行改革，其中 GRE 数学部分，即 Quantitative 也进行了相应修改。总体上讲 GRE 数学部分难度有所提高。

但是在 Quantitative 中考试所要求的能力和以前考试一样。在 ETS 所出的 Official Guide（以下简称 OG）中，明确的写到新 GRE 在 Quantitative 部分的考察学生内容为：

● 基本数学
● 基本数学概念的理解
● 定量推理、建模以及利用数学方法解决问题的能力

GRE 数学考试目的以及出题基本假设

一、GRE 数学的考试目的：

1. 精通算术运算
2. 精通代数方程的求解
3. 具有将文字信息转换为数学术语的能力
4. 具有构想几个图像以及数之间关系的能力
5. 具有用直觉和非常规的方法去解决一般数学问题的能力
6. 具有在真实生活场景中运用数学的能力

二、GRE 数学的出题基本假设

1. All numbers used are real numbers.
所有的数都是实数

2. All figures lie on a plane unless otherwise indicated.
除非题目中有专门指出，假设所有图形都在同一平面内

3. All angle measures are positive
所有的测量值都是正数

4. All line shown as straight are straight. On the computer-based test, lines that appear "jagged" can also be assumed to be straight.
所有显示为直线的线都可以当作直线来处理

5. Figures are intended to provide useful information for answering the questions. However, except where a figure is accomplish by a "Note" stating that the figure is drawn to scale, solve the problem using your knowledge of mathematics, not by visual measurement or estimation.
伴随问题的图形将为解题提供有用的信息。但是，只有在问题中指出相应图形是按比例画出（drawn to scale）时，才可以用目测或者估计而得到的信息去解题。否则只能运用你的数学知识去回答问题。

GRE 数学考试的核心考点

　　GRE 数学部分的考试主要围绕四个大的方面来考的，分别是 Arithmetic(算数)，Algebra(代数),Geometry(几何),Data Analysis(数据分析)。

　　以上四部分的考题在考试中间出现的大概比例依次是 24%，34%，14%以及 28%。所以相对来说，分布还是比较均匀。　各个部分主要考点如下：

一、Arithmetic 算数：

Divisibility

Factorization

Prime numbers

Remainders

Odd integers

Even integers

Arithmetic operations

Exponents

Radicals

Estimation percent

Ratio

Rate

Absolute value

The number line

Decimal representation

Sequences of numbers

二、Algebra 代数

Operation with exponents

Factoring and simplifying algebraic expression

Relations

Functions

Equations

Inequalities

Solving linear equations and inequalities

Solving quadratic equations and inequalities

Setting up equations and inequalities then solve them

Coordinate geometry

三、Geometry 几何

Parallel lines

Perpendicular lines

Circles

Triangles

Isosceles

Equilateral

Quadrilaterals

Other polygons
Congruent and similar figures
Area
Perimeter
Volume
The Pythagorean Theorem
Angle measurement in degrees
四、Data analysis (数据分析)
Basic descriptive statistics
Mean
Median
Mode
Range
Standard deviation
Interquartile range
Quartile
Percentiles
Elementary probability
Compound events and independent events
Combinations
Permutations
Venn diagrams
Line graphs
Segmented bar graph
Bar graphs
Circle graphs
Boxplots
Scatterplots

GRE 数学题型

在新 GRE 数学考试里面，会遇到 4 种题型。分别是：
1. 数量比较题 Quantitative Comparison questions
2. 单项选择题 Multiple-choice questions—Select One Answer Choice
3. 不定项选择题 Multiple-choice questions—Select One or More Answer Choices
4. 数字填空题 Numeric Entry questions

在一个 section 的 20 道题里面大概分别占比 8:8:2:2。

例题分析

1.

Quantity A	Quantity B
The least prime number greater than 24	The greatest prime number less than 28

A Quantity A is greater.

B Quantity B is greater.

C The two quantities are equal.

D The relationship cannot be determined from the information given.

2.

A certain jar contains 60 jelly beans—22 white, 18 green, 11 yellow, 5 red, and 4 purple. If a jelly bean is to be chosen at random, what is the probability that the jelly bean will be neither red nor purple?

A 0.09

B 0.15

C 0.54

D 0.85

E 0.91

3.

Which two of the following numbers have a product that is between −1 and 0 ?

Indicate both of the numbers.

A −20

B −10

C 2^{-4}

D 3^{-2}

4.

A merchant made a profit of $5 on the sale of a sweater that cost the merchant $15. What is the profit expressed as a percent of the merchant's cost?
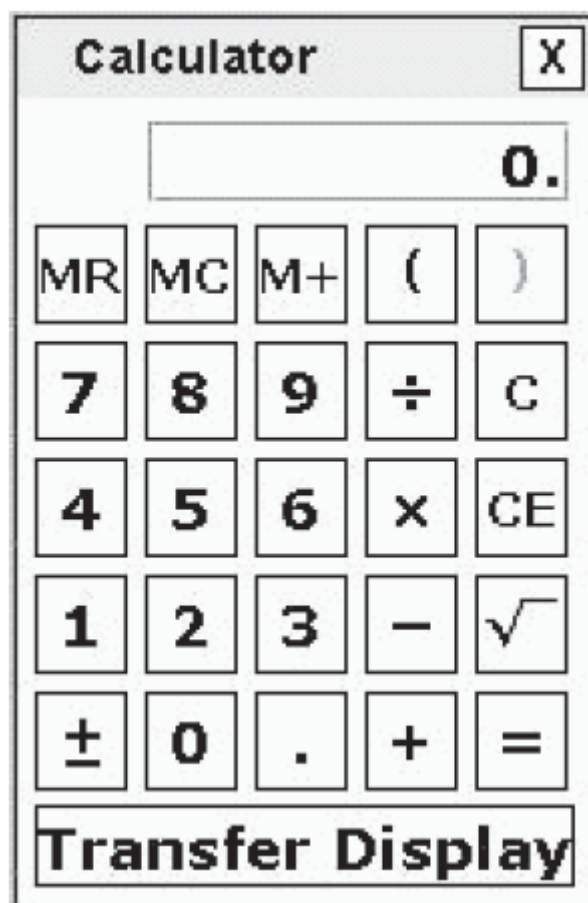
Give your answer to the nearest whole percent.

_____%

计算器使用技巧

大多数的计算不需要计算器，不要因为他在那儿就非要使用

一些简单的计算，尽量不要使用计算器

注意运算顺序

有些计算很巧妙的回避计算过程，不要过分依赖计算器

使用 Transfer Display 时，注意近似的位数 (4.4456)

在做分数题的时候，计算结果有小数的时候

GRE 数学中常见错误

题目看不懂或者理解不对（英语不好）

考点遗忘过多（数学不好）

审题有问题（挖坑就跳）

手抖选错（剁手）

算数

整数

Integers 整数: {...,-3,-2,-1,0,1,2,3,...}
Positive integers 正整数：{1,2,3,4,...}
Negative integers 负整数：{-1,-2,-3,...}
0 既不是正的也不是负的。
整数相加相减相乘的正负性：如负负得正。

因子

Factors (divisors) 因子：如果一个小的数能整除大的数，称为因子。如 2 是 6 的因子。3 不是 8 的因子。
Multiples 倍数：当小的数是大的数的因子时，大的数反过来称为小的数的倍数。
Least common multiple 最小公倍数：如 30 和 75 的最小公倍数是 150.
Greatest common divisor 最大公约数：如 30 和 75 的最大公约数是 15.

带余除法

a 除以 b 得 q 余 r：a divided by b is q with remainder r. a=bq+r
注意我们讨论整数带余除法时，只讨论 a，b 都是整数。

奇偶性

Odd number 奇数：{...,-3，-1，1，3，5，...}
Even number 偶数：{-4,-2,0,2,4,...}
奇偶数相加相减的奇偶性：如一堆奇数相乘还是奇数。

质数

Prime number 质数：只有两个不同因子的正整数，如 2,3,5,7 等。
Composite number 合数：有两个以上的因子的正整数，如 4,8,9 等。
1 既不是质数也不是合数。0 和负数既不是质数也不是合数。
质因数分解：一个合数本身不是质数，但是可以写成一堆指数的乘积。

如 $12 = 2^2 \times 3$，$1155 = 3 \times 5 \times 7 \times 11$。

分数

Fractions 分数：能表示成 $\dfrac{a}{b}$ 的数称为分数，其中 a,b 都是整数。也称为有理数。

  a 称为 numerator 分子，b 称为 denominator 分母。

Mixed number 带分数：如 $4\dfrac{3}{8} = \dfrac{35}{8}$。

指数和根

3^4：其中 3 称为 base 底，4 称为 exponent 指数。

$a^{-n} = \dfrac{1}{a^n}$，$a^0 = 1$。

如果底是负数时，要注意最后结果的正负性。

Square root 平方根：如 $\sqrt{4} = 2$。

GRE 数学中不考虑虚数，所以 $\sqrt{-1}$ 无意义。

小数

ones/units, tens, hundreds, thousands, ... tenths, hundredths,thousandths 分别代表个位数，十位数，百位数，千位数，十分位数，百分位数，千分位数。

有限小数和循环小数一定可以化为分数，也即有理数。无限不循环小数不可以化为分数，也就不是有理数。

实数

有理数和无理数统称为实数。实数和数轴是一一对应的。

GRE 数学中所有的数如无特意声明，都是实数。

比例

Ratio of a to b 代表 $\dfrac{a}{b}$。注意此处 a 和 b 可能是很长的从句。

百分数

一种特殊的分数表示方法。如 $32\% = \dfrac{32}{100}$。

当问 A 增长（减少）到了 B，问增长（减少）的百分比时，为 $\dfrac{|A-B|}{A}$（除以原来的值）

当问 A 比 B 大（小）的百分比时，为 $\dfrac{|A-B|}{B}$（除以 than 后面的值）

例题

1.

If m,n are integers and m^3n^2 is a negative odd integer, which of the following must be true?

A m+n is odd

B mn is even

C m^3n^5 is negative

D mn^4 is negative

2.

When 20 is divided by the positive integer k, the reminder is k-2, which of the following is a possible value of k?

A 8

B 9

C 10

D 11

E 12

3.

When the positive integer n is divided by 45, the reminder is 18. Which of the following must be a divisor of n?

A 11

B 9

C 7

D 6

E 4

4.

Which of the following integers CANNOT be expressed as the sum of two prime numbers?

A 8

B 9

C 10

D 11

E 12

5.

D is the decimal form of the fraction $\dfrac{4}{11}$

Quantity A	Quantity B
The 25th digit to the right of the decimal point in D	4

6.

Quantity A	Quantity B
$\sqrt[3]{270} - \sqrt[3]{10}$	$\sqrt[3]{80}$

7.

n is an even negative integer

Quantity A	Quantity B
$(\dfrac{1}{3})^n$	$(-3)^n$

8.

The price of a certain stock was $12\dfrac{1}{2}$ dollars per share.

The price increased x percent to $15\dfrac{5}{8}$ dollars per share.

Quantity A	Quantity B
x	20

9.

The integers x and y are greater than 1. If $(4x)(7y) = 756$, what is the value of x + y?

10.

1,-3,4,1,-3,4,1,-3,4,...

In the sequence above, the first 3 terms repeat without end. What is the sum of the terms of the sequence from 150th term to 154th term?

11.

If n is any prime number greater than 2, which of the following CANNOT be a prime number?

A n-4

B n-3

C n-1

D n+2

E n+5

12.

For each integer n > 1, let A(n) denote the sum of the integers from 1 to n. For example, A(100) = 1 + 2 + 3 + ... + 100 = 5050. What is the value of A(200)?

A 10100
B 15050
C 15150
D 20100
E 21500

13.

Marie earned $0.75 for every mile she walked in a charity walkathon. If she earned a total of $18.00 at that rate, how many miles did she walk?

A 13.5
B 17.5
C 21
D 22.5
E 24

14.

What is the nearest value of $\dfrac{0.16667 \times 0.83333 \times 0.33333}{0.22222 \times 0.66667 \times 0.12500}$?

A 2.00
B 2.40
C 2.43
D 2.49
E 3.43

15.

Which of the following represents the total dollar amount that a customer would have to pay for an item that costs s dollars plus a sales tax of 8 percent, in terms of s?

A $\dfrac{s}{0.08}$

B $\dfrac{s}{1.08}$

C $\dfrac{s}{8}$

D 0.08s
E 1.08s

16.

The "reflection" of a positive integer is obtained by reversing its digits. For example, 321 is the reflection of 123. The difference between a five-digit

integer and its reflection must be divisible by which of the following?

A 2

B 4

C 5

D 6

E 9

17.

Suppose $a^2 + b^2 = c^2$, and a,b,c are all integers. Which of the following

CANNOT be the value of a + b + c?

A 2

B 1

C -2

D 4

E 6

代数

代数式

Algebraic expression: 带着未知数的式子称为代数式，如 $3x^2 + 2xy - 3$。

Terms 项：如上式中包含 $3x^2$，$2xy$ 和 -3 共三项。

like terms or similar terms 同类项：如 $3xy$ 和 $-2xy$。

constant term 常数项：如 $3x^2 + 2xy - 3$ 中的 -3。

Coefficient 系数：如 $3x^2$ 的系数为 3。

指数

形如 x^a 为指数式，x 为底，a 为指数。

$$x^{-a} = \frac{1}{x^a}; \quad (x^a)(x^b) = x^{a+b}; \quad \frac{x^a}{x^b} = x^{a-b}; \quad x^0 = 1;$$

$$(xy)^a = x^a y^a ; \quad (\frac{x}{y})^a = \frac{x^a}{y^a} ; \quad (x^a)^b = x^{ab}$$

一次方程

解一元一次方程：如 $11x - 4 - 8x = 2(x + 4) - 2x$

解二元一次方程组：如 $\begin{cases} 4x + 3y = 13 \\ x + 2y = 2 \end{cases}$。

二次方程

Quadratic function 二次方程：形如 $ax^2 + bx + c = 0$ 其中 $a \neq 0$。

二次方程求根公式：$\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

其中 $\Delta = b^2 - 4ac > 0$ 时有两个根，

$\Delta = b^2 - 4ac = 0$ 时有一个根，

$\Delta = b^2 - 4ac < 0$ 时无根。

不等式

当对不等式进行变换时，等式两边同时乘以或除以一个负数时，不等式变号。
解二次不等式的时候，可以利用函数图像进行求解。

函数

Domain 定义域：函数所有有定义的 x 值。
Range 值域：函数所有可能的取值。

利息

Simple interest 单利：$V = P(1 + r\% \times t)$

Compound interest 复利：$V = P(1 + r\%)^t$

Compound n times per year 一年 n 次复利：$V = P(1+\dfrac{r\%}{n})^{nt}$

其中 P 为本金，V 为 t 年后的总值，利率为 r%每年。

解析几何

rectangular coordinate system, xy-coordinate system or xy-plane：坐标平面
x-axis ： x 坐标轴；origin 原点
P' is reflection of P about x-axis，P' and P are symmetric about x-axis：P 和 P'关于 x
　　轴对称

距离公式：(x_1, y_1) 和 (x_2, y_2) 的距离是 $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

Intercept 截距：如 $y = x^2 - 4$ 交 x 轴与(2,0)和(-2,0)，于是 x 截距是 2 和-2.

交 y 轴与(0,-4),于是 y 截距是-4.

直线

过 (x_1, y_1) 和 (x_2, y_2) 的直线 slope 斜率为 $m = \dfrac{y_2 - y_1}{x_2 - x_1}$。

当斜率为正时，直线是斜向上的，反之为斜向下的，等于 0 时为水平的。
两条直线 parallel 平行当且仅当他们的斜率相等。
两直线 perpendicular 垂直当且仅当他们的斜率乘积为-1.

函数图像

$y = ax + b$ 的图像为直线。

$y = ax^2 + bx + c$ 的图像为抛物线。

$(x-a)^2 + (y-b)^2 = r^2$ 的图像为圆，圆心位于(a,b),半径为 r。

例题

1.

$$\frac{x(x-2)}{(x+3)(x-4)^2} = 0$$

Quantity A	Quantity B
x	-2

2.

Quantity A	Quantity B
$\dfrac{1}{x}$	$\dfrac{x+1}{x^2}$

3.

$(4x-2y)(6x+3y) = 18$

Quantity A	Quantity B
$4x^2 - y^2$	6

4.

If $xy^2 = 12$ and $xy = 4$, then x=?

A 1

B 2

C $\sqrt{3}$

D $\dfrac{2}{3}$

E $\dfrac{4}{3}$

5.

Which of the following is equal to $\dfrac{2^{x-y}}{2^{x+y}}$ for all integers x and y?

A 4^{-x}

B 4^{-y}

C 4^{xy}

D 4^{x}

E 4^{y}

6.

How many integers are in the solution set of the inequality $x^2 - 10 < 0$?

A two

B five

C six

D seven

E ten

7.

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.

A (2,18)

B (5, 12)

C (10, 7)

D (12, 3)

E (15, 2)

8.

A group of 5,000 investors responded to a survey asking whether they owned stocks and whether they owned bonds. Of the group, 20 percent responded that they owned only one of the two types of investments. If r is the number of investors in the group who owned stocks but not bonds, which of the following represents the number of investors in the group who owned bonds but not stocks, in terms of r?

A 5000-r

B 1000-r

C r-1000

D 1000r

E (0.2)(5000-r)

9.

The function f has the property that f (x) = f (x + 1) for all numbers x. If f (4) = 17, what is the value of f (8)?

10.

If $\dfrac{m+n}{4+5} = \dfrac{m}{4} + \dfrac{n}{5}$, which of the following statement must be true?

A m = n

B 5m = 4n

C 5m =4n

D 25m = 16n

E 25m = 16n

11.

Sixty-eight people are sitting in 20 cars and each car contains at most 4 people. What is the maximum possible number of cars that could contain exactly 1 of the 68 people?

A 2

B 3

C 4

D 8

E 12

12.

How many integers between 101 and 201 are equal to the square of some integer?

A two

B three

C four

D five

E six

13.

x+y=-1,

Quantity A	Quantity B
x	y

14.

Line k lies in the xy-plane. The x-intercept of line k is -4, and line k passes through the midpoint of the line segment whose endpoints are (2; 9) and (2; 0). What is the slope of line k? Give your answer as a fraction.

15.

x is an integer greater than 1.

Quantity A	Quantity B
3^{x+1}	4^x

16.

Parallelogram OPQR lies in the xy-plane, as shown in the figure.
The coordinates of the point P are (2; 4) and the coordinates of the point
Q are (8; 6). What are the coordinates of point R?
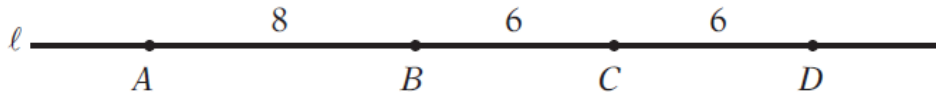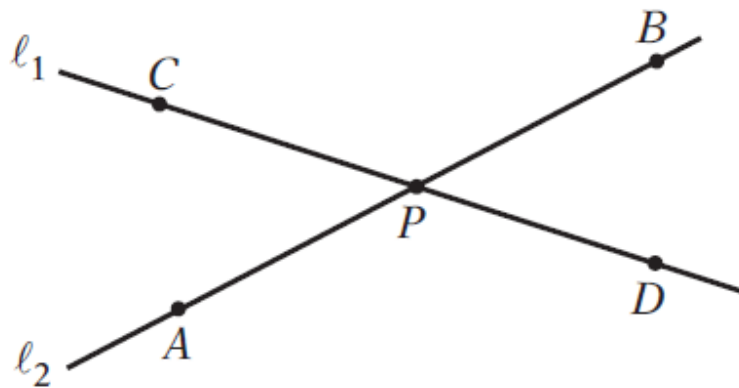
A (3; 2)

B (3; 3)

C (4; 4)

D (5; 2)

E (6; 2)
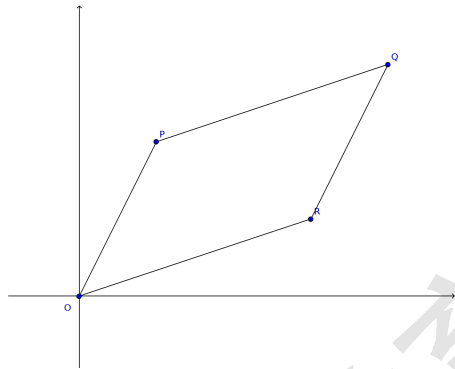
17.
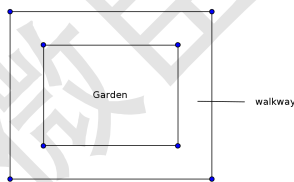
The figure above represents a rectangular garden with a walkway around
it. The garden is 18 feet long and 12 feet wide. The walkway is uniformly
3 feet wide, and its edge meet at right angles. What is the area of the
walkway?

几何

直线和夹角

如图所示，A,B,C 为 point 点。L 为 line 直线。AB,BC,CD 为 line segment 线段　AB 的 endpoints 端点为 A 和 B　AB 的 length 长度为 8。BD 的中点为 C。

两直线相交会形成 4 个 angle 角。他们共用一个 vertex 顶点 P。

APC 和 BPD 为对顶角，他们的角度相同。BPC 和 APD 为另一组对顶角。

Acute angle 锐角是小于 90 度的角，obtuse angle 钝角是大于 90 度的角，right angle 直角是等于 90 度的角。

我们一般用 ⊥ 表示垂直，或者画一个小正方形表示垂直。

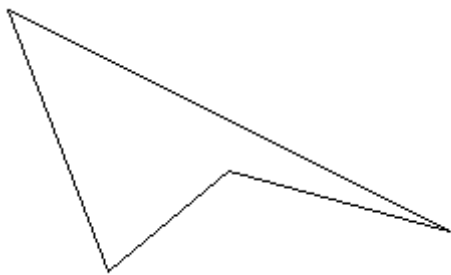$$ON \perp OP$$
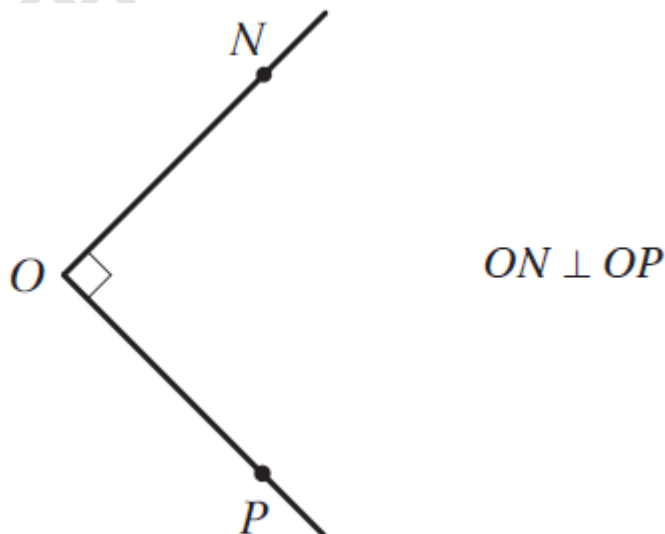
两直线平行，则形成的同位角内错角相等。
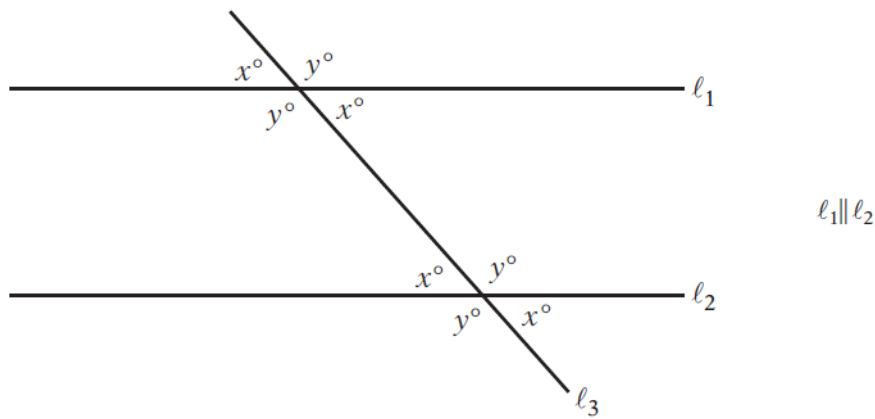
多边形

Polygons 多边形即有多个边的图形。GRE 数学中不考虑凹多边形，即类似于如下的图形。

Triagnle 三角形，quadrilateral 四边形，pentagon 五边形，hexagon 六边形，octagon 八边形。

N 边的多边形内角和为 $180(N-2)$ 度。
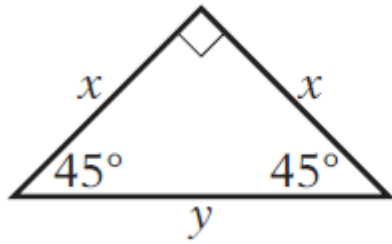
Regular polygon 正多边形即每条边都一样长而且每个角都一样大的多边形。

三角形

三角形内角和为 180 度。
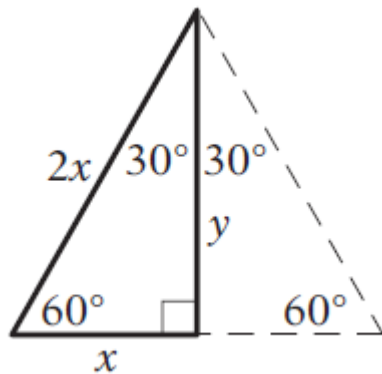
equilateral triangle 等边三角形，isosceles triangle 等腰三角形，/right triangle 直角三角形，legs 直角边，hypotenuse 斜边。

Pythagorean theorem 勾股定理，即直角三角形斜边平方等于两直角边平方和。

两个特殊的直角三角形：

$$y^2 = x^2 + x^2$$
$$y^2 = 2x^2$$
$$y = \sqrt{2}x$$

三角形的面积为 $\frac{1}{2}bh$，b 为底，h 为高。

相似和全等

两个三角形形状一样但是大小不一样称为 similar 相似。判定法则为对应角度都一样。

两个三角形不仅形状一样，而且大小一样就称为全等 congruent。判定法则有二：
1.当两三角形对应角都一样即相似时，如果还有某一条对应边相同，那么全等。
2.当两三角形两对应边相同而且这两条边的夹角也相同时（边角边），两三角形全等。

四边形

Rectangle 长方形，square 正方形，parallelogram 平行四边形，trapezoid 梯形。
梯形面积为（上底+下底）*高/2

圆

circle 圆，center 圆心，radius 半径，diameter 直径，chord 弦，arc 弧，circumference 周长，area 面积，sector 扇形，concentric circles 同心圆。

圆的周长为 $2\pi r$，面积为 πr^2。

立体图形

rectangular solid 长方体，cube 立方体，face 面，edges 边，vertex 顶点。

Volume 体积为 $V = lwh$，lwh 分别为长宽高。表面积即 6 个面（长方形）面积相加。

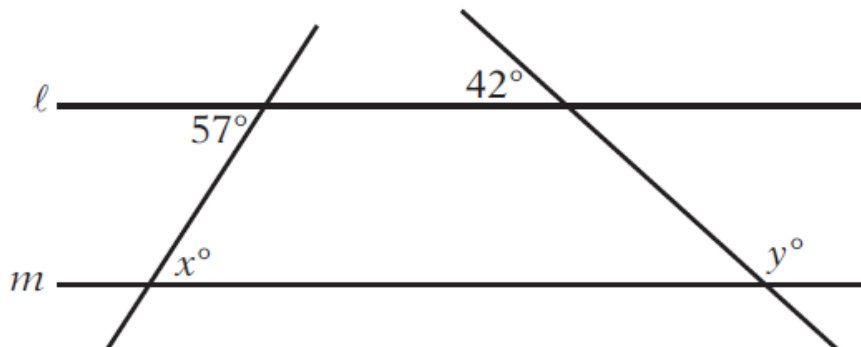circular cylinder 圆柱，体积为 $\pi r^2 h$，表面积为上下底面（圆）加上侧面共

$2\pi r^2 + 2\pi rh$，其中 r 为半径，h 为高。
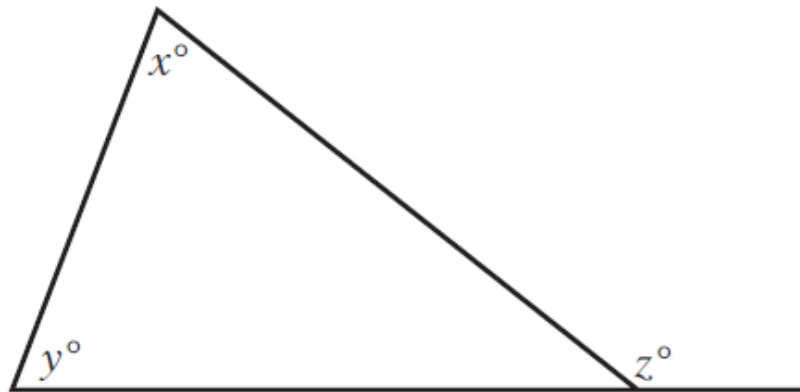
Cone 圆锥，体积为 $\dfrac{1}{3}\pi r^2 h$。

例题

1.

Lines l and m below are parallel. Find the values of x and y.
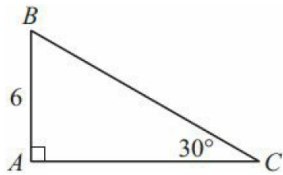

2.

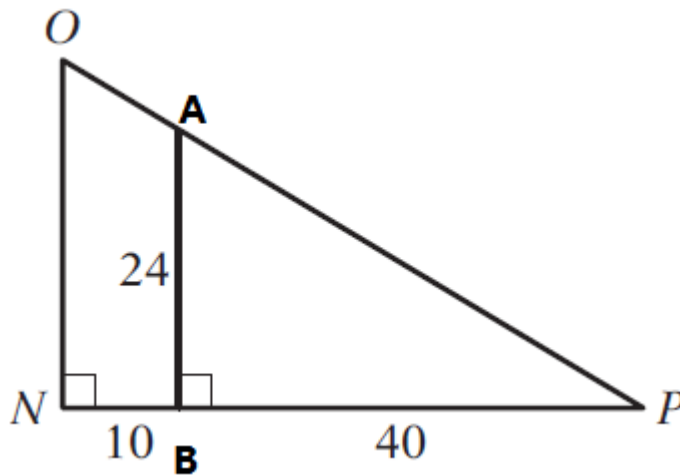In the figure, what is the relationship between x,y,and z?

3.

What is the area of triangle ABC shown above?

A 18

B 20

C $12\sqrt{3}$

D $18\sqrt{3}$

E 36

4.

What is the sum of the measures of the interior angles of a decagon (10-sided polygon)?

5.

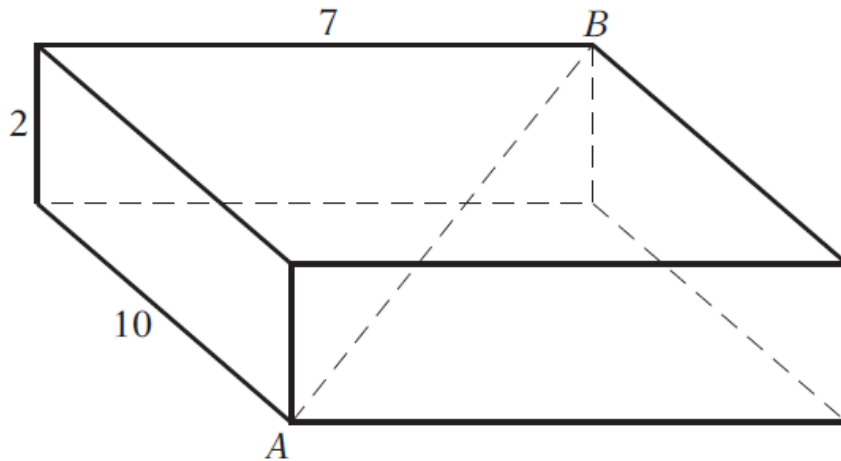What are the lengths of sides NO and OP in triangle NOP below?

6.

The radius of circle A is r , and the radius of circle B is 3

4 r.What is the ratio of the area of circle A to the area of circle B ?

A 1 to 4

B 3 to 4

C 4 to 3

D 9 to 16

E 16 to 9

7.

For the rectangular solid below, find the following.
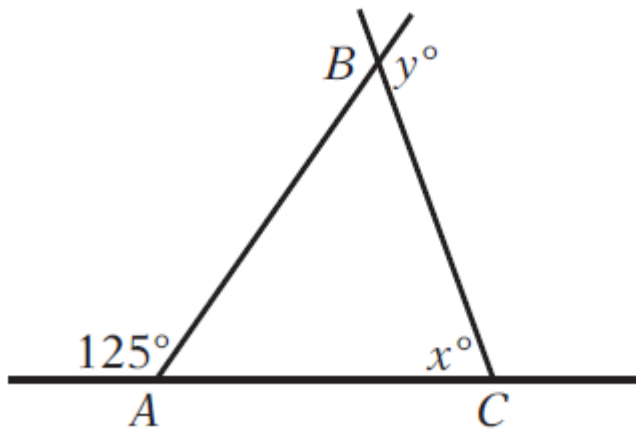
(a) Surface area of the solid

(b) Length of diagonal AB

8.

In the figure below, AC=BC. Find the values of x and y.

9.

If a decagon (10-sides polygon) is regular, what is the measure of each interior angle?

10.

The lengths of two sides of an isosceles triangle are 15 and 22, respectively. What are the possible values of the perimeter?

11.

Triangles PQR and XYZ are similar. If PQ=6, PR=4, and XY=9, what is the length of side XZ?

12.

The volume V of a right circular cylinder is $V = \pi r^2 h$, where r is the radius of the base and h is the height of the cylinder. If the volume of a right circular cylinder is 45π and its height is 5, what is the circumference of its base?

A 3

B 9

C 3π

D 6π

E 9π

13.

The figure below shows two concentric circles, each with center O. Given that the larger circle has radius 12 and the smaller circle has radius 7, find the following.

(a) Circumference of the larger circle

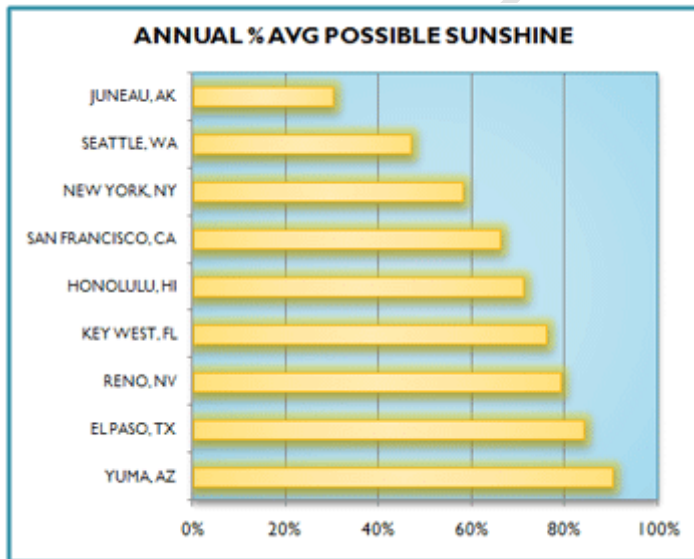(b) Area of the smaller circle
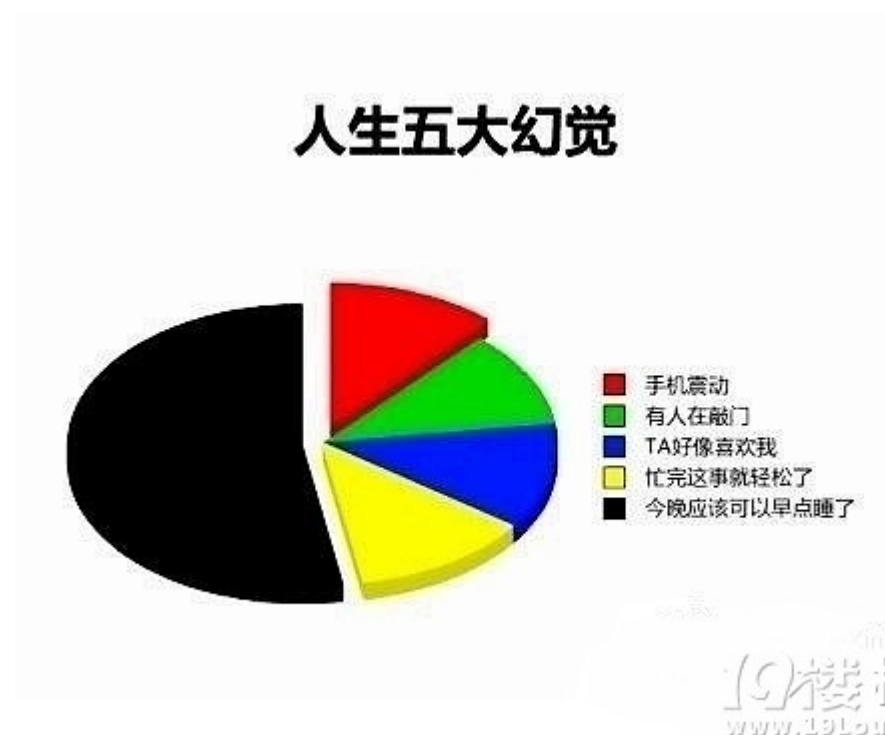
(c) Area of the shaded region
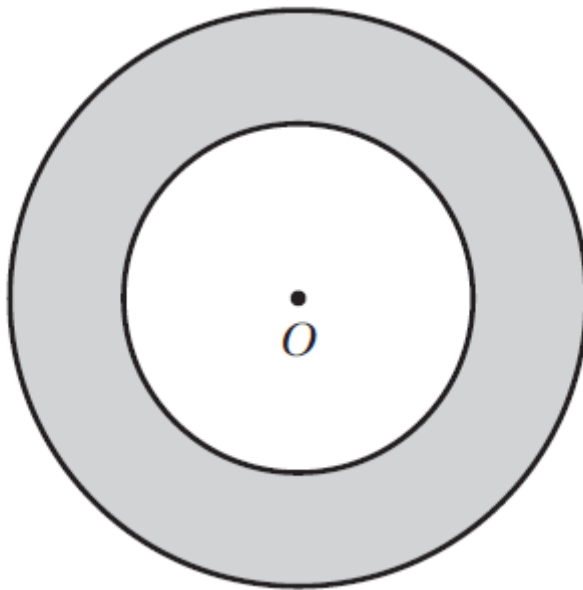
数据分析

图表

大体上图表分为以下几种：

1. 频　　率　　分　　布　　图　　，　　　　如

分组	频数累计	频数	频率	频率/组距
[10.75,10.85)	3	3	0.03	0.3
[10.85,10.95)	12	9	0.09	0.9
[10.95,11.05)	25	13	0.13	1.3
[11.05,11.15)	41	16	0.16	1.6
[11.15,11.25)	67	26	0.26	2.6
[11.25,11.35)	87	20	0.20	2.0
[11.35,11.45)	94	7	0.07	0.7
[11.45,11.55)	98	4	0.04	0.4
[11.55,11.65]	100	2	0.02	0.2
合计		100	1	10

2. 条形图，如

ANNUAL % AVG POSSIBLE SUNSHINE

JUNEAU, AK
SEATTLE, WA
NEW YORK, NY
SAN FRANCISCO, CA
HONOLULU, HI
KEY WEST, FL
RENO, NV
EL PASO, TX
YUMA, AZ

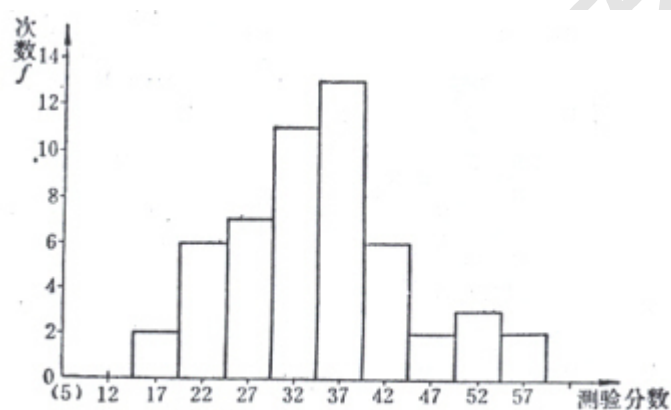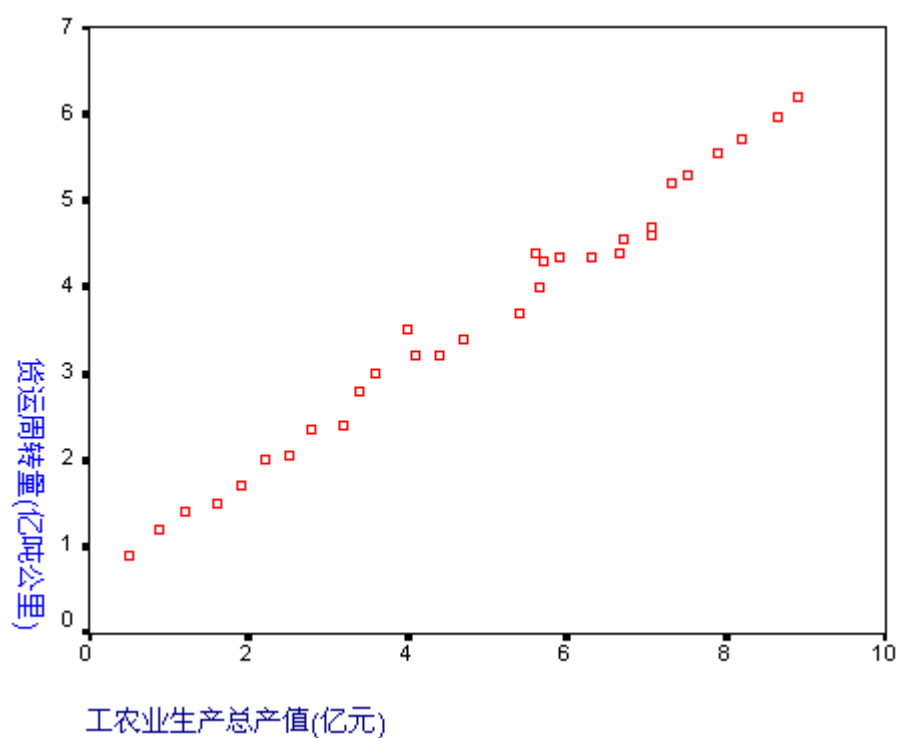0%　20%　40%　60%　80%　100%

3. 饼状图，如

4. 直方图，如

图 1-1　52 名学生拼写测验成绩次数直方图

5. 散点图，如

6. 折线图，如

其中直方图和条形图的差别仅在于分类之间是否有大小关系。

区分每道题给定的图表是什么类型毫无用处，要点在于读懂图表给的信息。

统计

Mean 平均数：如给定 6,4,7,10,7,4 共 6 个数，平均数为 $\frac{6+4+7+10+7+4}{6}=\frac{38}{6}$。

Standard deviation 标准差：GRE 数学中定义为除以总共数据个数，不减一。

Median 中位数：将数据从小到大排列之后中间的数即为中位数。如果总共有奇数个数据，那么最中间的数为中位数，如果有偶数个数据，则中间的两个数平均数为中位数。

Mode 众数：数据中出现次数最多的数为众数。

Quartile 四分位数：将数据从小到大排列，大概位于 1/4 位置的数即为第一个四分位数,第二个四分位数即中位数,大概位于3/4位置的数即为第三个四分位数。

Range 极差：最大的数减去最小的数。

Interquartile range 四分位差：第三个四分位数减去第一个四分位数。

集合

Set 集合：即一些东西（无重复）的总称。

List 数据集：即一堆数据（可以重复）。

Intersection 交集：两个集合公共的元素合在一起。

Union 并集：至少属于两个集合中一个的元素合在一起。

排列组合

当从 n 个元素里取出 m 个排成一排，总共不同的排列个数为 A_n^m。

从 n 个元素里取出 m 个，总共不同的个数为 C_n^m。

排列和组合的区别在于有没有顺序。

概率

概率的定义即总共满足条件的结果个数与所有可能结果个数的比例。比如掷骰子掷出奇数的概率为 $\frac{3}{6}$。

两个事件 independent 独立：$P(E)*P(F)=P(E\ F)$，其中 $E\ F$ 表示 E 和 F 同时发生。

两个事件 mutual exclusive 不相交：$P(E\ F)=0$ 即不可能同时发生。

正态分布

正态分布是单峰对称的，于是 mean,median,mode 都一样。
左右各一个，两个，三个标准差以内的概率为 68%，95%和 99.5%。

例题

1.

If W is a random variable that is normally distributed with a mean of 5 and a standard deviation 2. What is P(W > 5) Approximately what is P(3 < W < 7)? Which of the four numbers 0.5, 0.1,0.05 or 0.01 is the best estimate of P(W < -1)?

2.

Consider an experiment with events A, B, and C for which P(A) = 0.23, P(B) = 0.40, and P(C) = 0.85. Suppose that events A and B are mutually exclusive and events B and C are independent. What are the probabilities P(A or B) and P(B or C)?

3.

Suppose that a computer password consists of four characters such that the first character is one of the 10 digits from 0 to 9 and each of the next 3 characters is any one of the uppercase letters from the 26 letters of the English alphabet. How many different passwords are possible?

4.

How many different five-digit positive integers can be formed using the digits 1, 2, 3, 4, 5, 6, and 7 if none of the digits can occur more than once in the integer?

5.

Suppose you want to select a 3-person committee from a group of 9 students. How many ways are there to do this?

6.

The average (arithmetic mean) of 4 donations to a charity was $80. Two of the 4 donations were $90 and $60.

Quantity A	Quantity B
The average of the other 2 donations	80

7.

Quantity A	Quantity B
The sum of the first	7 times the median of
7 positive integers	the first 7 positive integers

8.

The graph above shows the distribution of three different flavors of hard Candies-cherry, lemon, and lime-in a candy jar. If all the lemon candies are removed and no other candies are added or removed, what fraction of the remaining candies in the jar will be lime candies?
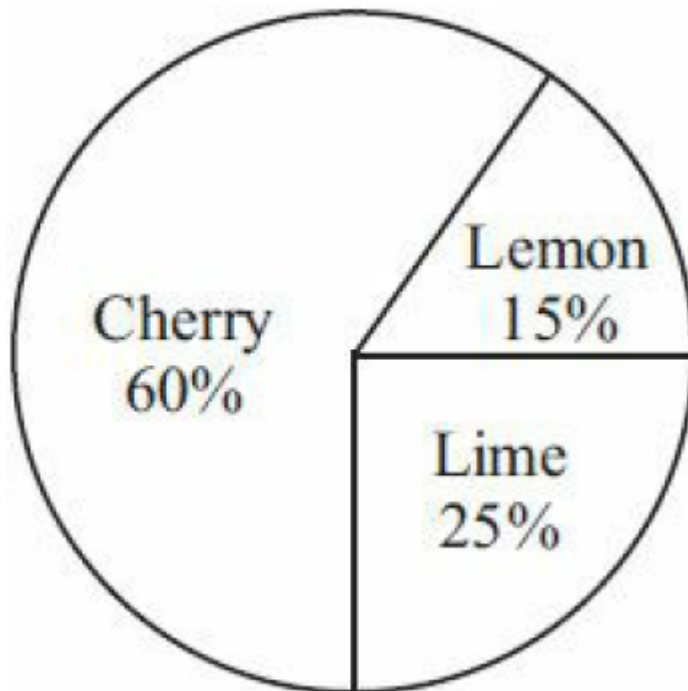
9.

In a distribution of 850 different measurements, x centimeters is at the 73rd percentile. If there are 68 measurements in the distribution that are greater than y centimeters but less than x centimeters, then y is approximately at what percentile in the distribution?

A 45th
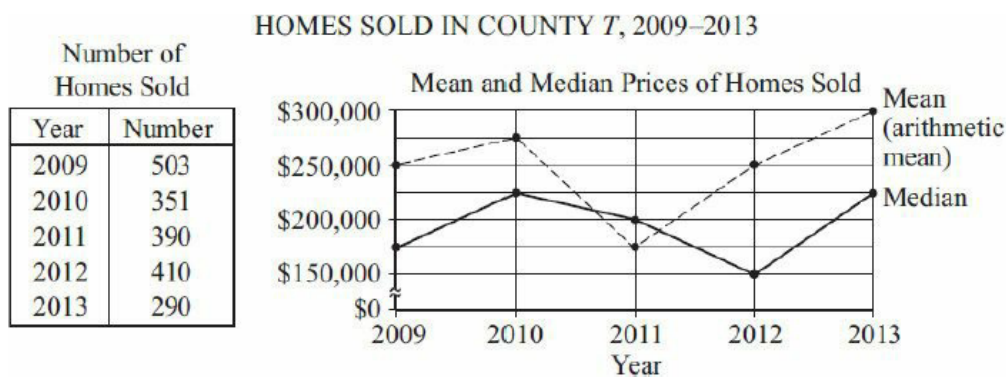
B 50th

C 55th

D 60th

E 65th

10.

For a certain distribution, the measurement 12.1 is 1.5 standard deviations below the mean, and the measurement 17.5 is 3.0 standard deviations above the mean. What is the mean of the distribution?

A 13.8

B 13.9

C 14.0

D 14.1

E 14.2

11.

Set A has 50 members and set B has 53 members. At least 2 of the members in set A are not in set B. Which of the following could be the number of members in set B that are not in set A ? Indicate all such numbers.

A 3

B 5

C 13

D 25

E 50

F 53

HOMES SOLD IN COUNTY *T*, 2009–2013

Number of Homes Sold

Year	Number
2009	503
2010	351
2011	390
2012	410
2013	290

Mean and Median Prices of Homes Sold

12.

Which of the following is closest to the mean of the prices of the 700 homes sold in 2012 and 2013 combined?

A $265; 000   D 280; 000

B $270; 000   E 285; 000

C $275; 000

13.

By approximately what percent did the median price of homes sold in County T decrease from 2011 to 2012 ?

A 10%

B 15%

C 25%

D 33%

E 50%

14.

Based on the information given, which of the following statements about the sum of the prices of all the homes sold in a given year must be true? Indicate all such statements.

A The sum of the prices for 2010 was greater than the sum for 2009.

B The sum of the prices for 2010 was greater than the sum for 2011.

C The sum of the prices for 2009 was greater than the sum for 2011.

15.

County T collected a tax equal to 3 percent of the price of each home sold in the county in 2009. Approximately how much did County T collect in taxes from all homes sold in 2009 ?

A $38,000

B $260, 000

C $380, 000

D $2,600,000

E $3, 800,000

16.

In a probability experiment, G and H are independent events. The probability that G will occur is r, and the probability that H will occur is s, where both r and s are greater than 0.

Quantity A   Quantity B

The probability that either G $r + s - rs$
will occur or H will occur, but not both

17.

$S = \{1,4,7,10\}$, $T = \{2,3,5,8,13\}$. x is a number in S, and y is a number in T

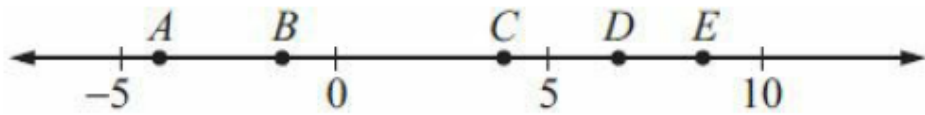　　　　Quantity A　　　　　　　　Quantity B

The number of different possible　　　20
values of the product xy

18.

From the 5 points A, B, C, D, and E on the number line above, 3 different points are to be randomly selected. What is the probability that the coordinates of the 3 points selected will all be positive?

19.

R is a list of 15 consecutive integers, and T is a list of 21 consecutive integers. The median of the integers in list R is equal to the least integer in list T. If the two lists are combined into one list of 36 integers, how many different integers are on the combined list?

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