SAT
ACT
Manual

Master
Trained
Tutors

INTRODUCTION

Over the next several weeks, you will learn things which will change the way you think about standardized tests, and in the process raise your scores significantly on the SAT and/or ACT. We will teach you everything you need to know to maximize your potential on these tests. If you have any questions, or are having difficulty with any of the topics covered in class, ask your teacher to arrange some time outside of the class for extra help.

QA WHAT IS THE SAT?

The SAT is a three+-hour, mostly multiple-choice standardized test which attempts to measure potential for college success. There are 141 multiple-choice questions- 45 math, 52 reading, and 44 grammar. The SAT also contains 13 math questions which require test-takers to grid-in an answer, and a 50-minute essay. On the short math section of the SAT, students are not allowed to used calculators. Calculators are allowed on the longer SAT math section, and the entire math portion of the ACT.

Reading	Writing	Math NC	Math	Essay
65 minutes 52 Questions	35 minutes 44 questions	25 minutes 20 questions	55 minutes 38 questions	50-minute optional essay

QA WHAT IS THE ACT?

The ACT is a 3+ hour multiple-choice standardized test which also attempts to measure potential for college success. The Reading, English, and Math sections of the ACT are very similar to the corresponding sections of the SAT. In addition to these, there is also a Science Reasoning section and 40-minute optional essay.

English	Math	Reading	Science	Essay
45 minutes 75 Questions	60 minutes 60 Questions	35 minutes 40 questions	35 minutes 40 questions	40-minute optional essay

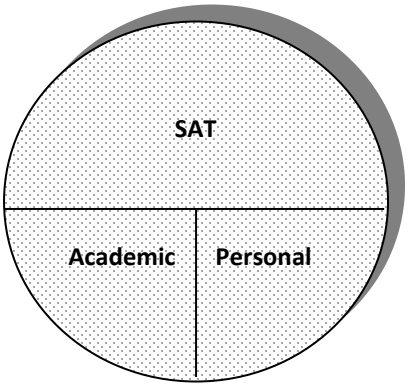
QA WHY ARE THE SAT AND ACT SO %$#& DIFFICULT?

The SAT and ACT are difficult because they contain weird questions, tricky answers, and an unfamiliar scoring system that penalizes human instincts. They are also difficult because people make them much harder than they need to be. **Don't sweat.** Because they are so consistent and predictable, they are very beatable tests.

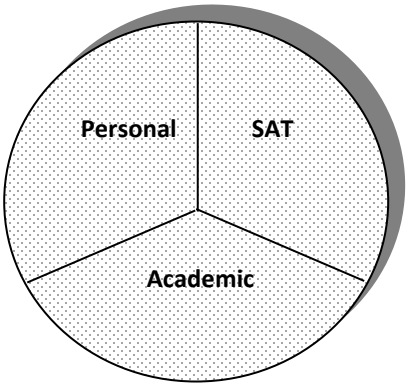
QA HOW IMPORTANT ARE THE SAT AND ACT?

Most colleges use the SAT or ACT as a major factor in admissions. As a rule of thumb, test scores account for one-third to one-half of the college admissions decision. Some schools even use the SAT or ACT as a cutoff point to pare down applicants. Colleges also consider your academies record (GPA, class selection, class rank) and personal qualities (leadership, extra-curriculars, hobbies).

Large *or* less competitive



Small *or* more competitive



QA WHAT ABOUT SCORE IMPROVEMENT?

Score improvements for College Insights students is an average of about 161 points on the SAT. Some people raise their scores more than 300 points! Score improvements for College Insights students is an average of about 4.6 points on the ACT, with 6-10 point improvements not uncommon. If you put time and effort into the class, do all of your homework, and follow the strategies and techniques, you can expect some serious score improvements. If you slack off, your improvements won't be as impressive. It's as simple as that.

There is no guessing penalty on either the SAT or ACT, but some guesses are better than others. Use the process of elimination if you don't know the correct answer. If you are guessing on difficult math questions, look for harder "looking" answer choices.

1 What color was the blanket of George Washington's horse?

(A) white (B) brown (C) π (D) 47.2 (E) 100 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

2 When did Alaska become a state?

(A) 444 B.C. (B) 1492 (C) 1776 (D) 1948 (E) 1952 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

ACT Conversion Chart

Scale Score	Raw Scores					Scale Score
	Test 1 English	Test 2 Mathematics	Test 3 Reading	Test 4 Science	Writing	
36	75	60	40	40	47-48	36
35	72-74	58-59	39	39	46	35
34	71	57	38	38	44-45	34
33	70	55-56	37	37	42-43	33
32	68-69	54	35-36	—	41	32
31	67	52-53	34	36	40	31
30	66	50-51	33	35	38-39	30
29	65	48-49	32	34	37	29
28	63-64	45-47	31	33	35-36	28
27	62	43-44	30	32	34	27
26	60-61	40-42	29	30-31	33	26
25	58-59	38-39	28	28-29	32	25
24	56-57	36-37	27	26-27	31	24
23	53-55	34-35	25-26	24-25	29-30	23
22	51-52	32-33	24	22-23	28	22
21	48-50	30-31	22-23	21	26-27	21
20	45-47	29	21	19-20	25	20
19	43-44	27-28	19-20	17-18	24	19
18	41-42	24-26	18	16	23	18
17	39-40	21-23	17	14-15	21-22	17
16	36-38	17-20	15-16	13	20	16
15	32-35	13-16	14	12	—	15
14	29-31	11-12	12-13	11	18-19	14
13	27-28	8-10	11	10	17	13
12	25-26	7	9-10	9	16	12
11	23-24	5-6	8	8	—	11
10	20-22	4	6-7	7	14-15	10
9	18-19	—	—	5-6	13	9
8	15-17	3	5	—	12	8
7	12-14	—	4	4	—	7
6	10-11	2	3	3	10-11	6
5	8-9	—	—	2	9	5
4	6-7	1	2	—	—	4
3	4-5	—	—	1	—	3
2	2-3	—	1	—	—	2
1	0-1	0	0	0	8	1

SAT Conversion Table **Scholastic Assessment Table**							
Raw Score	**SAT Score**			Raw Score	**SAT Score**		
	Math	Reading	Writing		Math	Reading	Writing
0	200	10	10	42	650	34	38
1	210	10	10	43	660	34	39
				44	670	35	40
2	220	10	10	45	680	35	
3	230	11	11	46	690	36	
4	250	12	12				
5	260	13	12	47	700	36	
6	280	13	13	48	710	37	
				49	720	38	
7	290	14	14	50	740	38	
8	310	15	15	51	760	39	
9	320	16	16				
10	330	17	17	52	770	40	
11	340	17	18	53	780		
				54	780		
12	360	18	19	55	790		
13	370	18	19	56	800		
14	380	19	20				
15	390	19	21	57	800		
16	400	20	21	58	800		
17	410	20	22				
18	420	21	22				
19	440	22	23				
20	450	22	23				
21	460	23	24				
22	470	23	24				
23	480	24	25				
24	490	**25**	26				
25	500	**25**	26				
26	510	**26**	27				
27	520	**26**	27				
28	520	**27**	28				
29	530	27	29				
30	550	28	29				
31	550	28	30				
32	560	29	31				
33	570	29	31				
34	580	30	32				
35	590	30	33				
36	590	31	33				
37	600	31	34				
38	610	32	35				
39	620	32	35				
40	630	33	36				
41	640	33	37				

CALCULATORS

Students taking the ACT are allowed to use any four-function, scientific, or graphing calculator. To make sure that your calculator follows the order of math operations, try this: $4 + 5 \cdot 6$. If you get 34, you're good. If you get 54, not so much. Students can use a calculator on the longer of the two SAT math sections. No calculator is allowed on the shorter one.

A calculator will help on only about half of all math questions. It won't make a difference on the other half. (On a couple of questions, it will actually make things more difficult.)

CALCULATOR TIPS

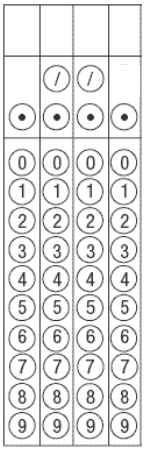
- Use a calculator for most arithmetic (*i.e.* addition, subtraction, multiplication, division, percentages, decimals, ratios)
- Set up the problem before you use your calculator
  1. $\frac{25}{450} = \frac{4}{x}$
  2. $25x = 450 \cdot 4$
  3. $x = \frac{450 \cdot 4}{25}$
  4. **NOW** use your calculator

GRID-INS

The SAT has questions which have no answer choices. Instead, students need to bubble in their answers into a grid. Grid-in questions are no more difficult than multiple-choice questions. In fact, most of the strategies and techniques, which you will learn, are the same for both.

You will practice grid-in questions in your math class; if you don't feel comfortable with grid-ins now, you will soon.

20.4



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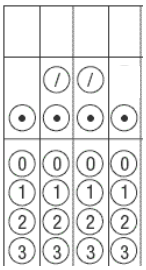
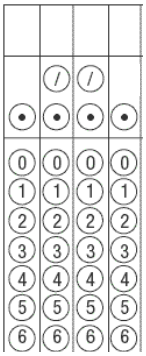
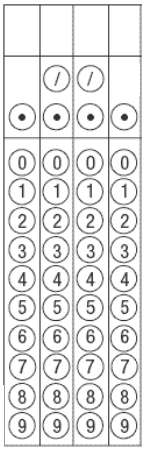
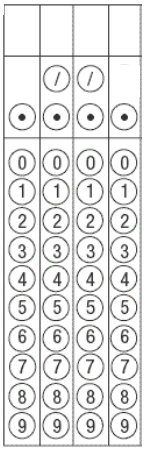








MATH

VERBAL

ARITHMETIC

TERMS AND DEFINITIONS

Integers: Anything but fractions or decimals (-5, -2, 0, 1, 5, 435…)

Digits: 0123456789 (245 is a three digit integer)

Prime Numbers: Numbers divisible by only themselves and 1 (2, 7, 11)

Consecutive Numbers: From left to right on number line (-2, -1, 0, 1)

Sum: Add 'em

Difference: Subtract 'em

Product: Multiply 'em

Inclusive: Include the numbers given (*5 through 8, inclusive means (5,6,7,8)*

Multiple: 6, 9, 12, 15, and 18 are all multiples of 3

Factors: If a number divides evenly into another number, it is a factor (1,2,3,6 are factors of 6)

Divisible: A number is divisible by another if, when dividing, 0 is the remainder. (The smaller number is a divisor of the larger)

Remainder: What's left over when you divide. (5 divided by 2 leaves a remainder of 1)

PROBLEMS

Set *S* = {-8, -6.5, -2, 0, 5, 7}

How many members of set *S* are integers? _____

How many members of set *S* are prime numbers? _____

What is the sum of the numbers in set *S*? _____

What is the product of the numbers in set *S*? _____

How many members of set *S* are greater than -6.4? _____

Name three consecutive negative integers: _____, _____, _____

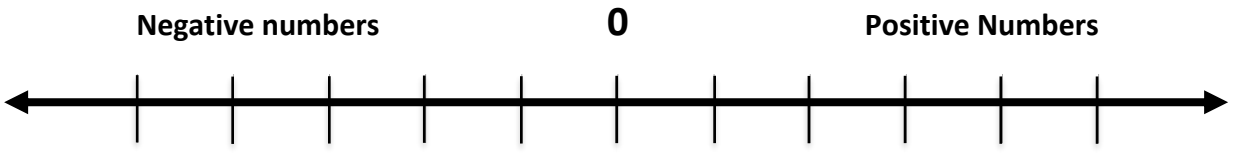
What is the first prime number greater than 7? _____

What is the greatest integer less than 2.1? _____

What is the least integer greater than -4.6? _____

How many numbers between 3 and 20, inclusive, are divisible by 3? _____

THE NUMBER LINE



PROBLEMS

10 Each of the following two-digit numbers has one digit covered. Which of these five numbers COULD NOT be a multiple of 14?

(A) [redacted]8

(B) [redacted]4

(C) 6[redacted]

(D) 9[redacted]

(E) 4[redacted]

11 How many prime numbers are factors of 24?

(A) 0

(B) 1

(C) 2

(D) 3

(E) 12

12 In which of the following pairs of numbers is the sum of the numbers 5 less than their product.

(A) (5,6)

(B) (4,5)

(C) (3,6)

(D) (2,7)

(E) (1,8)

FRACTIONS

$\frac{2}{3}+\frac{3}{4}=$ _____

$\frac{3}{8}\cdot\frac{12}{15}=$ _____

$\frac{10}{11}+\frac{11}{10}=$ _____

$\frac{5}{6}\cdot\frac{3}{4}=$ _____

$\frac{1}{2}-\frac{1}{3}=$ _____

$\frac{2}{5}\div\frac{6}{10}=$ _____

$\frac{1}{6}-\frac{1}{5}=$ _____

$\frac{4}{5}\div\frac{1}{5}=$ _____

(a) $\left(\frac{1}{2}-\frac{1}{3}\right)+\frac{1}{12}$

(b) $\left(\frac{3}{4}+\frac{1}{7}\right)\left(-\frac{2}{5}\right)$

(c) $\frac{3}{8}\div\frac{27}{32}$

(d) $\left(\frac{1}{2}+\frac{2}{5}\right)\left(\frac{10}{9}\right)$

PROBLEMS:

9 $\left(1-\frac{5}{7}\right)\left(1+\frac{3}{4}\right)$ is

(A) $\frac{1}{28}$ (B) $\frac{3}{14}$ (C) $\frac{9}{28}$ (D) $\frac{13}{28}$ (E) $\frac{1}{2}$

11 $\frac{1}{4}+\frac{2}{3}+\frac{3}{2}=$

(A) $\frac{1}{2}$ (B) $\frac{7}{12}$ (C) $\frac{2}{3}$ (D) $\frac{13}{12}$ (E) $\frac{29}{12}$

6 Which of the following is the greatest?

(A) $\frac{7}{9}$ (B) $\frac{3}{4}$ (C) $\frac{5}{7}$ (D) $\frac{8}{10}$ (E) $\frac{7}{16}$

14 $\frac{1}{\frac{1}{2}}+\frac{2}{\frac{2}{3}}+\frac{3}{\frac{3}{4}}=$

(A) $\frac{1}{9}$ (B) $\frac{1}{2}$ (C) $\frac{2}{3}$ (D) 8 (E) 9

DECIMALS

In the decimal system, the decimal point determines the values of the digits. For example, the digits in the number $6{,}789.321$ have the following place values:

6 "thousands"
7 "hundreds"
8 "tens"
9 "units"
3 "tenths"
2 "hundredths"
1 "thousandth"

PROBLEMS:

(a) add 54.012 to 2.91 _____

(b) subtract $.034$ from 2.135 _____

(c) multiply 5.5 by $.11$ _____

(d) divide 4.9 by $.7$ _____

(e) $100.26 \div 1.2 =$ _____

(f) $12.85 + 1.65 - .98 =$ _____

4 Which number is the largest?

(A) 100.011 (B) 100.029 (C) 100.031 (D) 100.00999 (E) 100.0199

5 The decimal representation for $2{,}000 + 2 + (2/100)$ is:

(A) 2,000.2002 (B) 2,002.202 (C) 2,002.0002 (D) 2,002.002 (E) 2,002.02

PERCENTAGES

ENGLISH	MATH	SYMBOL
of	multiply	•
what/what number	a variable	x
percent	over 100	$\frac{}{100}$
what percent	$\frac{variable}{100}$	$\frac{x}{100}$
is	equals	$=$

(A) 50 is what percent of 10 percent of 100?

$$50 = \frac{x}{100} \cdot \frac{10}{100} \cdot 100$$

$$\frac{50}{1} = \frac{x \cdot 10 \cdot 100}{100 \cdot 100 \cdot 1}$$

$$\frac{50}{1} = \frac{x}{10}$$

$$x = 500$$

(B) 5.6 is 20 percent of what number?

$$5.6 = \frac{20}{100} \cdot x$$

$$\frac{5.6}{1} = \frac{20x}{100}$$

$$\frac{5.6}{1} = \frac{x}{5}$$

$$x = 28$$

PROBLEMS

(a) 28 is 25% of what number?

(b) 8 is what percent of 40?

(c) What percent of 64 is 16?

(d) If Charlie answers 13 of 25 questions correctly, and all the others incorrectly, what percent of questions does he answer incorrectly?

(e) What is 2% of 300?

(f) 15 is what percent of 60?

11 One percent of 1,000 is 10 percent of what number?

(A) 1

(B) 10

(C) 100

(D) 1,000

(E) 10,000

17 In a graduating class of 450 students at Collegiate High School, 20% continued their education at 2-year colleges. If 75% of the remaining students attended four-year colleges, how many students attended four-year colleges?

(A) 90

(B) 133

(C) 180

(D) 270

(E) 338

CONVERSIONS

Fractions, decimals, and percentages are intimately related. Each can be used to express the same amount. For example, $^1/_2$ is the same as . 5 or 50%. To convert a fraction to a decimal, divide the top number by the bottom: $(^1/_4 = 1 \div 4 = .25)$. When you enter a percentage into a calculator, it is shown as a decimal: $(25\% = .25)$. To change a decimal to a percentage, move the decimal 2 places to the right: $(.4 = 40\%)$. Percentages are actually already fractions: $(30\% = ^{30}/_{100} = ^3/_{10})$.

COMPLETE THE FOLLOWING CHART:

Fraction	Percentage	Decimal
1/2		
2/5		
13/20		
	25%	
	60%	
	55%	
		.44
		.2
		.02

EXPRESS THE FOLLOWING PERCENTS IN DECIMALS AND FRACTIONS:

	Decimal	Fraction
(a) 15%	_____	_____
(b) 26.2%	_____	_____
(c) 131%	_____	_____
(d) .5%	_____	_____

WOULD YOU OR WOULDN'T YOU?

ON THE FOLLOWING QUESTIONS, DECIDE WHETHER YOU'D USE A CALCULATOR.

9 How many prime numbers are factors of 48?

7 $x^2 = 405$, which of the following is the closes approximation of x

11 George charges $4.20 per hour before midnight and $6.00 an hour after midnight for baby-sitting. If he started baby-sitting at 6 p.m., and charged a total of $28.50, at what time did he finish baby-sitting?

13 If x is an odd number, what is the next even number greater than $2x + 2$?

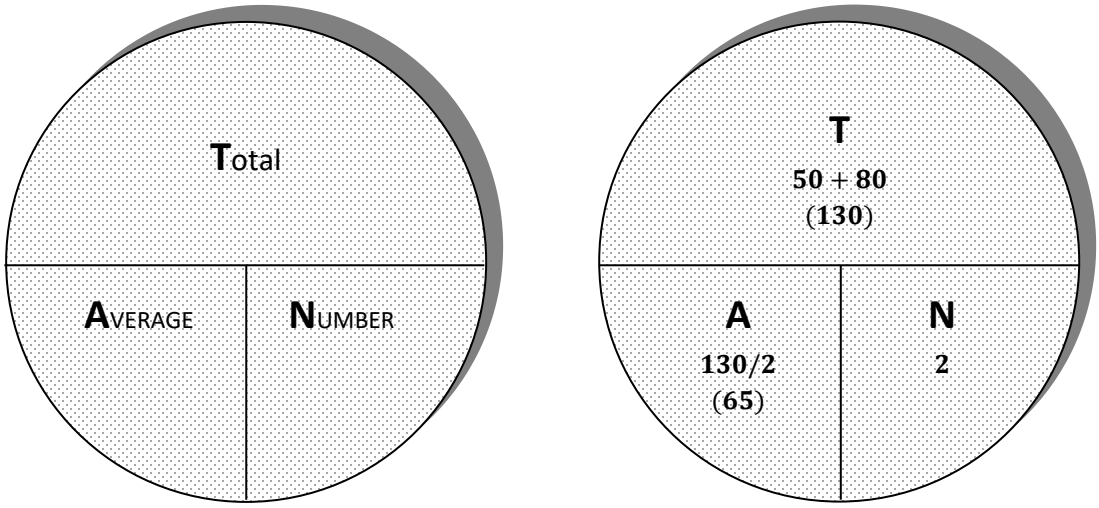
22 If $2x + 2y = 4y$, which of the following must be true?

17 Which of the following indicates the set of all numbers x such that there is a triangle with sides of x, $x + 1$, and $4 - x$?

MORE ARITHMETIC

AVERAGES

Everyone knows about averages. You add the numbers and divide. That works great in real life, but for the SAT you have to learn a different way to think about averages. The *TAN* principle should help.



So if you took 2 tests and scored a 50 on one and 80 on the other, your average is 65.

There are two ways to find the total:

1. **Sum of the numbers**
2. **Average • Number**

(a) What is the average of 10, 20, 35, and 35? _____

(b) If you bowl and average of 141 on three games, what's your total? ____

(c) What's the average of 6, 9, 11, 15, and x if their total is 100? ____

What does x equal? _____

MEDIAN AND MODE

The terms median and mode are less frequently used ways to describe averages. Test writers will always make clear which of the three definitions for averages to use. Plain averages are referred to as the arithmetic mean.

MEDIAN

The median is the middle number when a set of numbers is arranged from least to greatest. Think of the median of a highway. If there is an even number of elements, the median is the average of the middle two numbers.

$Set\ A = \{4,6,8,3,9\}$

Odd #

To find the median:
1. Arrange small to large: $\{3,4,6,8,9\}$
2. Median = middle: $\{3,4,\boxed{6},8,9,10\}$

Median = 6

$Set\ B = \{10,4,6,8,3,9\}$

Even #

To find the median:
1. Arrange small to large: $\{3,4,6,8,9,10\}$
2. Median = middle 2 #'s divided by 2: $\{3,4,\boxed{6,8},9\}$

Median = $\frac{6+8}{2}$

MODE

The mode is the most frequently repeated number in a set.

The mode of $\{0,1,2,3,3,4,4,4,5\}$ is 4, because it is repeated most often.

RANGE

Range is the difference of the largest and smallest numbers.

The range of $\{0,1,2,3,3,4,4,4,5\}$ is 5, because 5-0=5.

PROBLEMS

13 What is the average (arithmetic mean) of $\frac{7}{10}$, $\frac{1}{5}$, and $\frac{2}{20}$?

(A) $\frac{1}{5}$ (B) $\frac{1}{4}$ (C) $\frac{1}{3}$ (D) $\frac{2}{3}$ (E) 1

15 In a group of to students, 6 are 15 years old and 4 are 16 years old. What is the average age (arithmetic mean) of these 10 students?

(A) 12.4 (B) 13.2 (C) 14.3 (D) 15.4 (E) 16.7

16 Which of the following represents the median and mode of the following set of numbers, respectively: (2,3,3,3,4,5,5,6,7)

(A) (3,4) (B) (4,3) (C) (3,5) (D) (5,3) (E) (4,4)

12 A student has test scores of $60, 80, x,$ and x. If the average of all four scores is 75, what is the value of x?

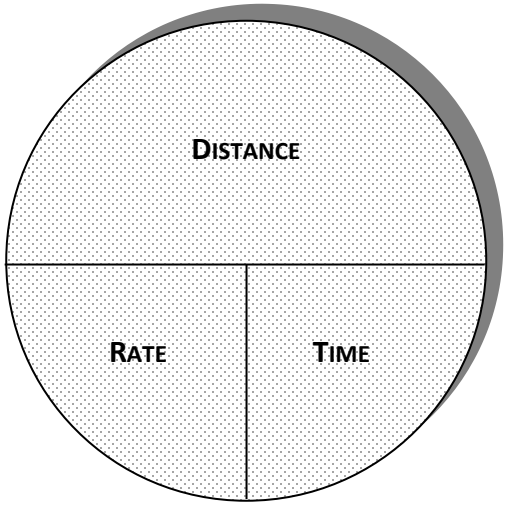
(A) 40 (B) 50 (C) 75 (D) 80 (E) 90

19 Adam scored an average of 25 points per game through the first 4 games of a five game season. If his final season average was 24 points per game, how many points did he score in the fifth game?

(A) 19 (B) 20 (C) 21 (D) 22 (E) 23

RATE, TIME & DISTANCE

It's best to think of these questions the same way you thought about averages. On the SAT, they will give you two of the three (rate, time, or distance), and you'll need to find the third.



(A) If you travel at 100 mph for seven hours, what is your total distance? _____

(B) If you travel 200 miles in four hours, what was your average speed? _____

(C) How long will it take to drive from Boston to New York (350 miles), if you average 70 mph? _____

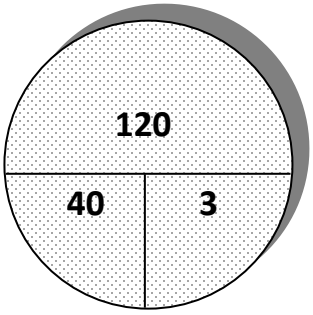
(D) Two bicyclists start 100 miles apart and head toward each other. If one bicyclist averages 20 miles per hour, and the other averages 30 miles per hour, how long will it take for them to meet? _____

AVERAGE SPEED

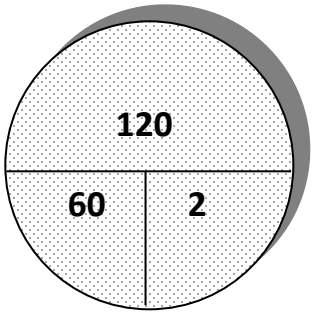
You may get a question which has a *RTD* problem combined with averages. Remember that distance means total distance traveled and time means total time. *Note: Especially important for 650 + math students*

19 Jill traveled for 3 hours at a rate of 40 kilometers per hour and 2 hours at a rate of 60 kilometers per hour. What was her average speed, in kilometers per hour for the entire 5-hour period?

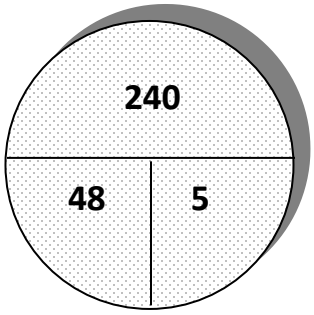
(A) 20 (B) 30 (C) 44 (D) 48 (E) 50



PART 1



PART 2



PART 3

PROBLEMS

18 A certain train travels for 240 miles at a rate of 60 miles per hour and returns on the same track at a rate of 30 miles per hour. How many hours does it require for the train to complete one round-trip?

(A) 3

(B) 8

(C) 11

(D) 12

(E) 13

13 Mike bicycled 240 miles in 12 hours without stopping. If she traveled at a constant rate, how many miles had she completed at the end of three hours?

(A) 42 (B) 45 (C) 50 (D) 56 (E) 60

19 Mary travels from *A* to *B* at an average rate of 60 miles per hour and then from *B* to *A* at 40 miles per hour. What was Mary's average speed for the round trip?

(A) 44

(B) 48

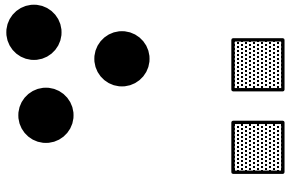
(C) 50

(D) 54

(E) 56

RATIOS

PART:PART AND PART:WHOLE



Total # = 5

Circles = 3

Squares = 2

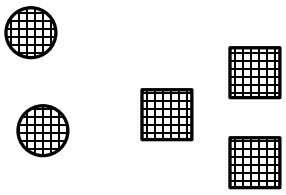
Ratios of circles:squares = $3:2$
Fractional parts equal $3/5$ and $2/5$

15 The ratio of blue fish to red fish in Roger's aquarium is $4:3$. If Roger has a total of 35 fish, how many are red?

(A) 7 (B) 15 (C) 21 (D) 28 (E) 35

RATIOS AS FRACTIONS AND PERCENTS

Ratios also can be expressed as fractions or percentages. Always keep $part:part$ and $part:whole$ in mind.



Ratio of two circles to three squares:

$$2:3 = part:part$$
$$2:5 = part:whole$$
$$2/5 = fractional\ equivalent$$
$$40\% = \%\ circles$$

RATIO NUMBERS & GROUPS

15 If there are 100 pieces of grapefruit and melon in a basket, which of the following could be the ratio of grapefruits to melons?

(A) $25:1$ (B) $5:1$ (C) $3:2$ (D) $50:1$ (E) $25:4$

16 There are only red and blue marbles in a jar in a ratio of $6:5$. Which of the following could not be the total number of marbles?

(A) 65 (B) 121 (C) 11 (D) 99 (E) 110

PROPORTIONS

9 If 3 boxes of chocolate contain 36 pieces of candy, how many pieces of candy are there in 8 boxes?

(A) 48 (B) 56 (C) 72 (D) 88 (E) 96

$$\frac{\mathbf{3}\ (\boldsymbol{boxes})}{\mathbf{36}\ (\boldsymbol{pieces})} = \frac{\mathbf{8}\ (\boldsymbol{boxes})}{\boldsymbol{x}\ (\boldsymbol{pieces})}$$

Cross multiply

$$3x = 36 \cdot 8$$

$$3x = 288$$

$$x = 96$$

TRY THE FOLLOWING PROBLEMS:

8 A solution contains ingredients A, *B, C,* and *D* with volumes in the ratio of $1:1:2:2$, respectively. What fraction of the volume of this solution is ingredient A?

(A) $\frac{1}{6}$ (B) $\frac{1}{5}$ (C) $\frac{1}{4}$ (D) $\frac{1}{3}$ (E) $\frac{1}{2}$

9 A novelty deck of cards consists of only Aces and Deuces. The ratio of Aces to Deuces is $2:3$. How many Aces are there in a deck of 50 cards?

(A) 5 (B) 10 (C) 15 (D) 20 (E) 30

10 A paint mixture contains red, yellow and blue paint in the ratio of $2:3:4$, respectively. If there are 72 gallons of paint total, how many gallons of yellow paint are there?

(A) 24 (B) 32 (C) 40 (D) 48 (E) 56

12 For every 4 times that the gears of a waterwheel are rotated, the paddle wheel turns 7 times. If the gears are rotated 200 times, what is the number of turns made by the paddle wheel?

(A) 114 (B) 280 (C) 350 (D) 800 (E) 1,400

17 If $\frac{x}{y} = \frac{2}{5}$ and $\frac{y}{z} = \frac{4}{3}$ what does $\frac{x}{z}$ equal?

(A) $\frac{8}{15}$ (B) $\frac{2}{3}$ (C) $\frac{9}{10}$ (D) $\frac{3}{2}$ (E) $\frac{15}{8}$

ALGEBRA

SOLVING FOR X

Algebra is really just advanced arithmetic, so many of the rules and terms are the same. The major difference is that in algebra, variables are introduced. Combinations of variables and numbers are called algebraic expressions. The bottom line in algebra is that you can do anything to an equation, as long as you do it to both sides. Solving an algebraic expression means isolating the variable.

$2x + 7 = 19$	**Subtract 7 from both sides**
$2x = 12$	**Divide both sides by 2**
$x = 6$	

INEQUALITIES

Solving inequalities is pretty much like solving for x. The only difference is that if you multiply or divide each side of an inequality by a negative number, the direction of the symbol is switched.

$-2x + 7 > 19$	**Subtract 7 from both sides**
$-2x > 12$	**Divide both sides by -2**
$X < -6$	

On some SAT and ACT algebra problems, the test makers fill in a variable for you. The other variables will fall like dominos. Take your time, write down all of your work, and be careful!

- $If\ x\ =\ 4y, and\ x\ =\ 32, then\ x\ +\ y\ =$

  (A) 48 (B) 40 (C) 36 (D) 32 (E) 28

- $If\ x = \frac{1}{4y} and\ p = 3x, what\ is\ the\ value\ of\ p\ when\ y = 20?$

  (A) 9 (B) 11 (C) 12 (D) 15 (E) 20

ALGEBRA TECHNIQUES

The SAT and ACT feature a pretty narrow range of algebra questions; there's usually a fairly easy way to answer them correctly. The trick on algebra is to use the answer choices to your advantage. One nice thing about multiple-choice questions is that only one of the answer choices can be correct.

PLUGGING IN

PLUGGING IN

Step one:	Choose numbers for all variables
Step two:	Solve the problem
Step three:	Circle the answer
Step four:	Find your answer

6 Meagan is now *x* years old, and is three times as old as her brother David. In terms of *x,* how old was David two years ago?

(A) $\frac{x}{3} - 2$ (B) $\frac{x}{3} + 2$ (C) $3x - 2$

(D) $3x + 2$ (E) $6x$

15 Jimmy has 5 dollars more than Bill has, but 3 dollars less than Chris. If Jimmy has x dollars, how many dollars do Chris and Bill have together?

(A) $2x - 8$ (B) $2x - 5$ (C) $2x - 2$ (D) $2x + 2$

(E) $2x + 8$

CHOOSING GOOD NUMBERS

The reason you plug in numbers on algebra problems with variables in, the answers is to make your life easy. Think before you plug in. If the question contains percentages, choose 100; minutes and seconds, choose 60. If it says a dozen, choose 12. Avoid choosing numbers which will give you fractions or negatives. Avoid the numbers 0 and 1, and numbers which are in the problem.

16 If *a*, *b*, and *c* are consecutive even integers, what does $a + c$ equal, in terms of *b?*

(A) $4b$

(B) $2b + 2$

(C) $2b$

(D) $\frac{b}{2}$

(E) $b + 2$

17 If $x = 3y$, $y = 2z$, and $t = 5z$, what is *t* in terms of x?

(A) $\frac{3x}{5}$ (B) $\frac{5x}{3}$ (C) $\frac{5x}{6}$ (D) $\frac{6x}{5}$ (E) $3x$

18 If it takes *p* pizzas to feed *s* students, how many pizzas does it take to feed x students?

(A) $\frac{sp}{x}$ (B) $\frac{x}{sp}$ (C) $\frac{px}{s}$ (D) $\frac{p}{sx}$ (E) spx

BACKSOLVING

BACKSOLVING

Step one:	Try answer choice C
Step two:	Plug it into the answer
Step three:	Did it work?
Step four:	Eliminate; go to B or D

15 If the sum of two consecutive multiples of 4 is 36, what is the larger of these multiples?

(A) 4

(B) 8

(C) 12

(D) 16

(E) 20

17 A certain anthropology class has exactly 36 students. If there are 6 more women than men in this class, how many students are women?

(A) 13

(B) 16

(C) 20

(D) 21

(E) 23

PROBLEMS

14 When a certain number x is divided by 5, the remainder is 2. When x is divided by 7, the remainder is 1. Which of the following is a possible value for x?

(A) 17

(B) 22

(C) 23

(D) 27

(E) 33

18 Darcy spent 50% of her money in one store and 20% of what was left at another store. If Darcy is left with 20 dollars, with how much money did she start?

(A) 50

(B) 60

(C) 70

(D) 80

(E) 90

19 Amy is now twice as old as Bill. Ten years ago she was 4 times as old as Bill was then. How old is Bill now?

(A) 25

(B) 20

(C) 15

(D) 10

(E) 5

PLUGGING IN II

PLUGGING IN II

Step one: Choose easy numbers
Step two: Solve the problem
Step three: Find your answer

Whenever there are variables in the question, and numbers in the answer choices, you can plug in. Choose easy numbers— like 100 for percents. In a multiple-choice test, there can only be one correct answer. **WATCH OUT FOR IT CANNOT BE DETERMINED.**

16 If v, w, x, y *and* z are consecutive odd integers and $v < w < x < y < z$, then $y + z$ is how much greater than $v + w$?

(A) 4

(B) 6

(C) 8

(D) 10

(E) 12

20 Beth owns x shares of the Biostaff Company. If she were to sell 20% of her shares in April, and 25% of her remaining shares in May, what percent of her original shares would she still own?

(A) 40%

(B) 45%

(C) 55%

(D) 60%

(E) 68%

15 If x and y are positive integers, and $x \div 7$ leaves a remainder of 3, and $y \div 7$ leaves a remainder of 4, what is the remainder when xy is divided by 7?

(A) 1

(B) 2

(C) 3

(D) 4

(E) 5

20 Two lists of four consecutive even integers contain exactly one integer in common. The sum of the integers on one list is how much greater than the sum on the other?

(A) 12

(B) 16

(C) 20

(D) 24

(E) 28

ALGEBRAIC REASONING

8 If x is an even integer, which of the following must be odd?

(A) $\frac{x}{2}$ (B) x^2 (C) $x^2 - 1$ (D) $2x - 2$ (E) $3x$

9 If a is a positive integer and b is a negative integer, which of the following must be positive?

(A) $\frac{a}{b}$ (B) $\frac{b}{a}$ (C) ab (D) $a^2 + b^2$ (E) a^2b

16 If x is a positive fractional number between 0 and 1, which of the following is the greatest?

(A) x^2 (B) x (C) $\frac{1}{x}$ (D) $\frac{1}{x^2}$ (E) $\frac{1}{x^3}$

EXPONENTS AND SQUARE ROOTS

If you're having trouble multiplying or dividing exponents, you can always expand the problem to visualize what's going on. 5^3 means $5 \bullet 5 \bullet 5$. $(2^2)^3$ means $(2 \bullet 2)(2 \bullet 2)(2 \bullet 2)$.

Same Base

MADS

When MULTIPLYING – ADD, when DIVIDING – SUBTRACT

$x^3 \bullet x^5 = x^8$ or $\frac{x^5}{x^3} = \frac{(xxxxx)}{(xxx)} = x^2$

$(xxx) \bullet (xxxxx)$

When a fraction is raised to any power, the exponent relates to the top and bottom of the fraction.

$$\left(\frac{2}{3}\right)^2 = \frac{4}{9}$$

When a fraction between 0 and 1 is squared, it gets smaller.

$$\left(\frac{1}{2}\right)^2 = \frac{1}{4}$$

Negative exponents are a way of writing reciprocals:

$$4^{-3} = \frac{1}{4^3}$$

Fractional exponents are a way of taking roots and powers:

$$4^{\frac{3}{2}} = \sqrt[2]{4^3}$$

Square roots

If $x^2 = 9$, then $x =$ either 3 or -3, but a square root is defined as the positive root only.

$$\sqrt{\frac{25}{9}} = \frac{\sqrt{25}}{\sqrt{9}} = \frac{5}{3} \; and \; \frac{\sqrt{200}}{\sqrt{2}} = \sqrt{100} = 10$$

FACTORING

Factoring questions require you to perform two simple operations, expanding and contracting algebraic expressions. Remember the FOIL method (first, outside, inside, last.)

EXPANDING

$$(x + 3)(x + 4) = x^2 + 4x + 3x + 12$$

$$= x^2 + 7x + 12$$

You have to recognize a couple of basics for quadratics. Memorize the following:

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$(a - b)^2 = a^2 - 2ab + b^2$$

$$(a - b)(a + b) = a^2 - b^2$$

CONTRACTING

$$x^2 + 4x - 12$$
$$= (x \quad)(x \quad)$$
$$= (x \quad 2)(x \quad 6)$$
$$= (x - 2)(x + 6)$$

RADICAL EQUATIONS

Solving radical equations is just like solving other algebraic equations but the last step usually involves squaring both sides.

$4 - \sqrt{n} = -1$	Add -1 to both sides
$5 - \sqrt{n} = 0$	Add $-\sqrt{n}$ to both sides
$5 = \sqrt{n}$	Square both sides
$25 = n$	

SIMULTANEOUS EQUATIONS

There probably will be at least one simultaneous equation on your SAT. Don't worry, it won't be as tough as it was in school. The trick to these questions is stacking.

$$If\ 3x - y = 20, and\ x + 2y = 18, what\ does\ 4x + y = ?$$

$$\begin{array}{r} 3x - y = 20 \\ +x + 2y = 18 \\ \hline 4x + y = 38 \end{array}$$

YOU CAN STACK SIMULTANEOUS EQUATIONS EITHER WAY, AND EITHER ADD THEM OR SUBTRACT THEM.

10 $If\ 2x - y = 14\ and\ x + y = 16, what\ does\ 3x = ?$

(A) 30

(B) 10

(C) 6

(D) 5

(E) -30

16 $If\ 3a - 3b = 2a + 3b = 50, what\ is\ the\ value\ of\ a?$

(A) 5

(B) 10

(C) 20

(D) 50

(E) 100

RATIONAL EQUATIONS

A rational equation is basically a fraction with polynomials on the top and the bottom. Don't worry. Plugging in and working backwards work great here.

16 For all values of x not equal to -2 or 3, simplify the following equation.

$$\frac{x^4 - 5x^3 - 2x^2 + 24x}{x^2 - x - 6}$$

(A) $x^2 - 4x$ (B) $x^2 - 5x - 2$ (C) $x + 24$

(D) x (E) $x - 4$

PROBLEMS

6 $(-3x)^2(4x) =$

(A) $36x^3$ (B) $36x^2$ (C) $18x^2$ (D) $-12x^2$

(E) $-18x^3$

8 $If\ \sqrt{t-5} = 3, then\ t =$

(A) 14 (B) 11 (C) 9 (D) $2 + \sqrt{5}$

(E) $2 - \sqrt{5}$

15 $\frac{(5^2)(5^3)}{5} =$

(A) 5^2 (B) 5^3 (C) 5^4 (D) 5^5 (E) 5^6

16 $(2 + \sqrt{5})(2 - \sqrt{5}) =$

(A) -1 (B) 0 (C) 1 (D) $2\sqrt{5} - 4$

(E) $2\sqrt{5} + 4$

ANGLES

GEOMETRY

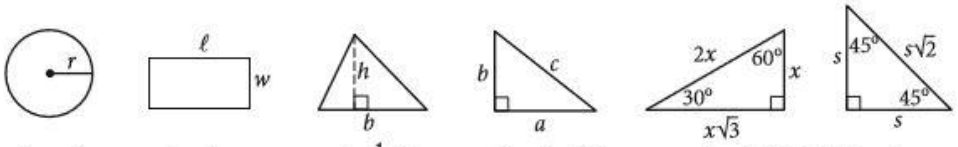
DIRECTIONS

For questions 1-15, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. **For questions 16-20**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE



$A = \pi r^2$
$C = 2\pi r$

$A = \ell w$

$A = \frac{1}{2}bh$

$c^2 = a^2 + b^2$

Special Right Triangles

$V = \ell wh$

$V = \pi r^2 h$

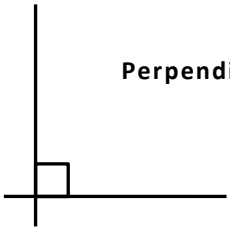
$V = \frac{4}{3}\pi r^3$

$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\ell wh$

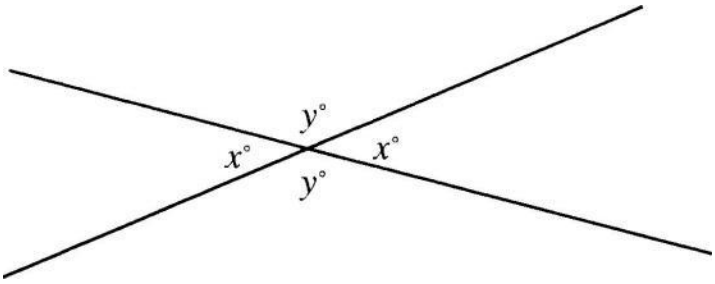
The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

The instructions and diagrams in the box above are identical to the information provided on the SAT. Your own your own for the ACT; The ACT provides not mathematical formulas. If you're answering a question that requires a formula, copy it down next to the problem before you begin.



Perpendicular lines

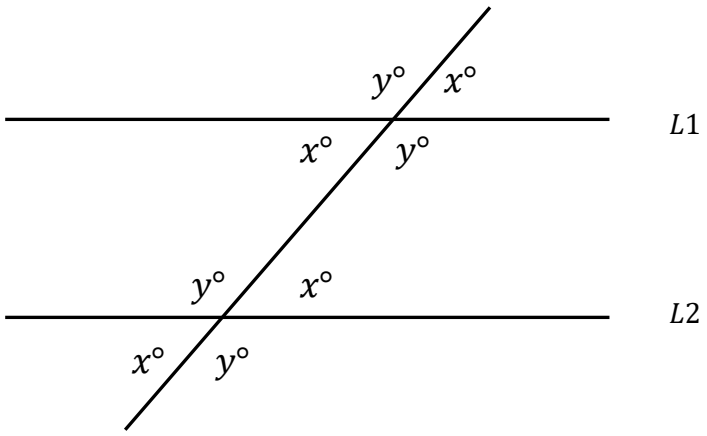
Lines are the building blocks of geometry. When two lines intersect, two pairs of angles are created. On the SAT, lines which look straight are straight. If lines are perpendicular, they will include the symbol for perpendicular lines. The angle created by perpendicular lines is a right angle, and a right angle has $90°$ (degrees).



When two lines intersect, two pairs of equal angles are created. These "opposite" angles are always equal. A straight line has $180°$, so $x° + y° = 180°$.

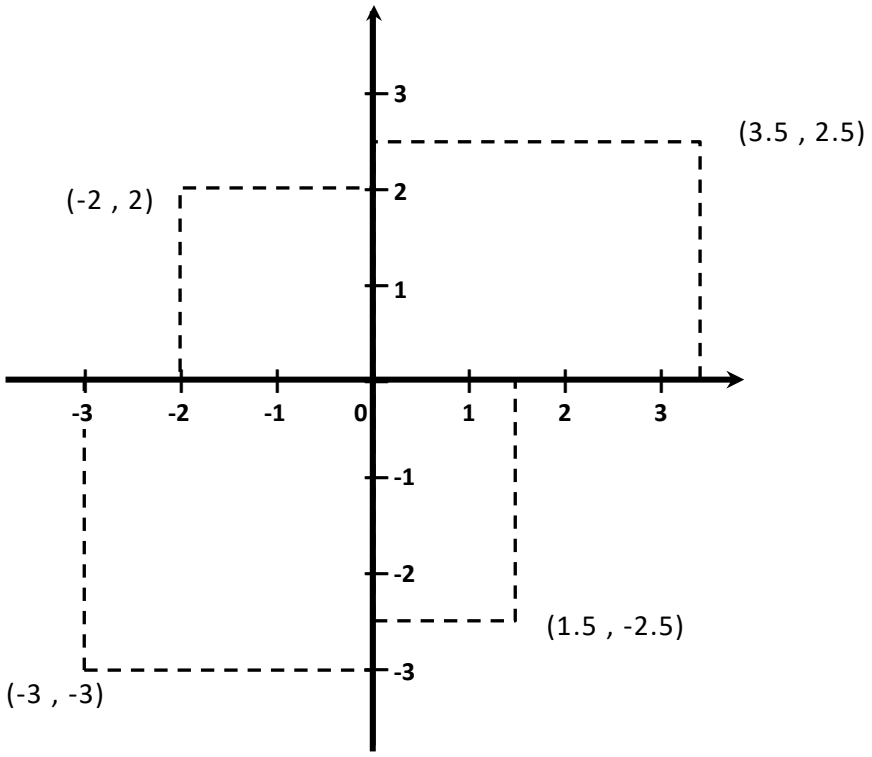
If two different lines in the same plane never intersect, they are called parallel. When parallel lines are intersected by a third line, it is important to remember that only two different angles are created.

PARALLEL LINES



When two parallel lines are intersected by a third line, all of the small angles are equal, and all of the big angles are equal. Any big angle + any small angle = $180°$

COORDINATE GEOMETRY



Each point in the coordinate geometry system can be identified by an ordered pair of real numbers called coordinates. The important thing to remember in coordinate geometry is that *x* expresses the distance from the left of zero (if negative), and right of zero (if positive) and that y expresses the distance below zero (if negative) and above zero (if positive).

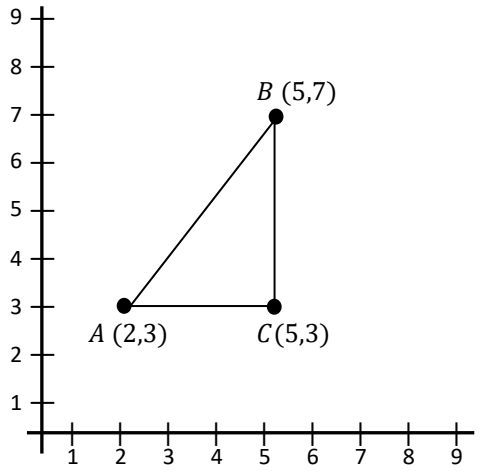
MIDPOINT & DISTANCE FORMULAE

To find the midpoint of a line segment in the coordinate plane, find the average of the x's and y's. If AB has endpoints A $(-3,-3)$ and B $(3.5,2.5)$, then the midpoint of AB is $(1/4,-1/4)$.

$$\frac{-3+3.5}{2} \quad , \quad \frac{-3+2.5}{2}$$

DISTANCE FORMULA

Use the Pythagorean Theorem to find the distance between two points in the coordinate plane. Because ΔABC is a right triangle, $AB^2 = 3^2 + 4^2$, or $AB = 5$.



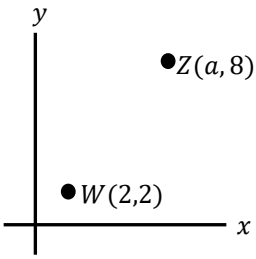
SLOPE

The SAT may include a question or two dealing with slope. Memorize the following and you should be fine.

Equation for a line: $y = mx + b$ **where…**

y **= the** y**-coordinate of a point on line**
x **= the** x**-coordinate of a point on a line**
m **= slope**
b **= the** y **coordinate where the line crosses the** y**-axis.**

Slope equals $\frac{rise}{run}$ **or** $\frac{y_2 - y_1}{x_2 - x_1}$

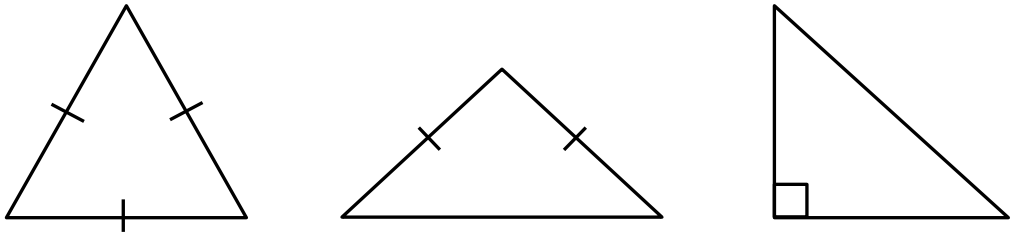


17 In the figure above, the slope of the line through points W and Z is 2. What is the value of a?

(A) 4 (B) 5 (C) 6 (D) 7 (E) 8

TRIANGLES

A closed three-sided geometric figure is called a triangle. If you know how to find the perimeter and the area of a triangle, you'll do great on the SAT. Every triangle has three sides, and three interior angles whose degree measures, when added together, equal 180°. Three important triangles are isosceles, equilateral, and right.



Equilateral Isosceles Right

PERIMETER

The perimeter of a triangle is the sum of the lengths of the three sides. It's important to remember that the length of each side of a triangle must be shorter than the sum of the other two sides.

5 If the perimeter of Δabc is 25, what is the length of x?

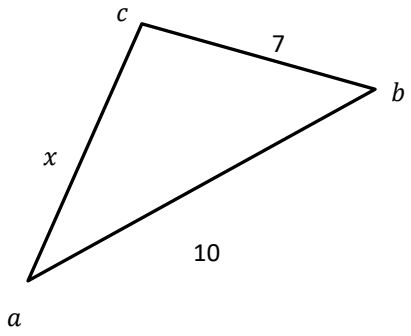
(A) 5

(B) 6

(C) 7

(D) 8

(E) 9



15 If each of the sides of Δdef is an integer, and df equals 5, and fe equals 4, what is the maximum possible length of x?

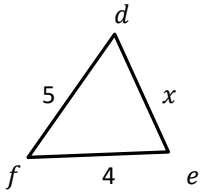
(A) 7

(B) 8

(C) 9

(D) 10

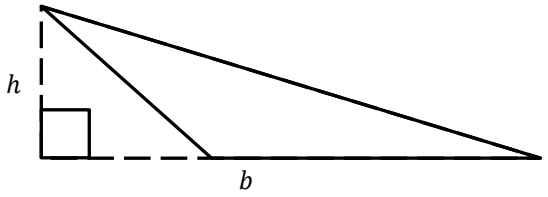
(E) 11



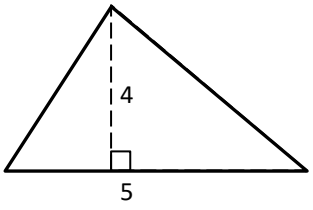
Note: figure not drawn to scale

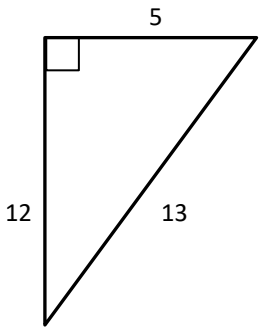
AREA

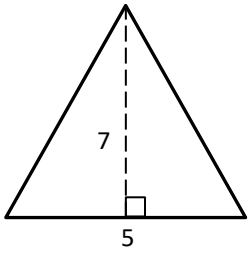
Area $\Delta = {}^{1}/_{2}\,bh$



DRILL: Find the areas in the following triangles.

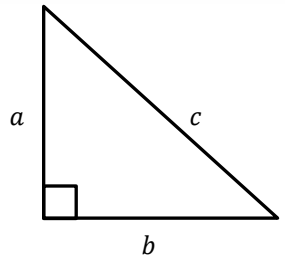




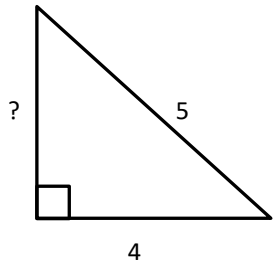


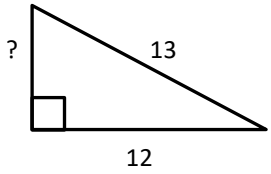
THE PYTHAGOREAN THEOREM

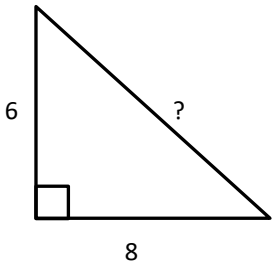
For any right triangle with legs a and b, and hypotenuse c,
$$a^2 + b^2 = c^2$$



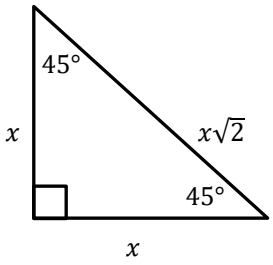
DRILL: Find the side not given in the following right triangles.

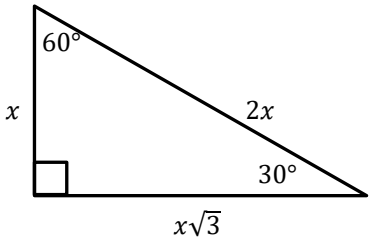


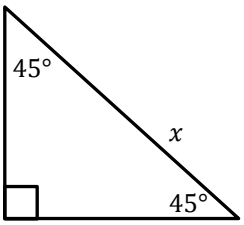




Isosceles Right	**30 : 60 : 90**







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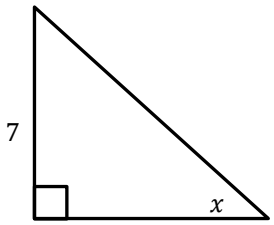

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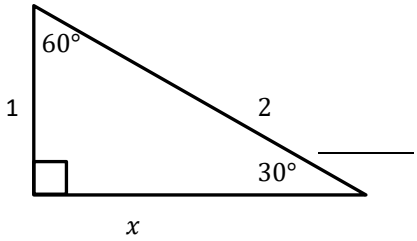

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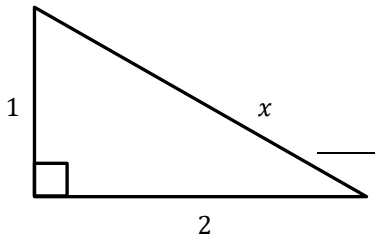


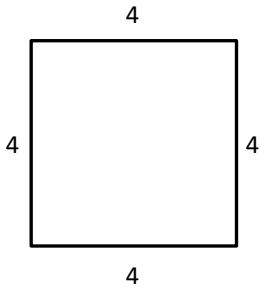
_____

QUADRILATERALS

Squares and rectangles are common examples of quadrilaterals. All quadrilaterals have four sides and four interior angles whose measures add up to $360°$. A rectangle is a quadrilateral with four equal angles. Opposite sides are parallel and are equal in length. A rectangle with four equal sides is a square.

PERIMETER

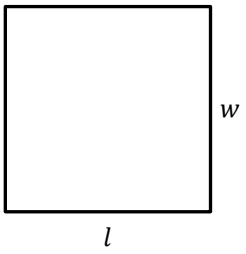
The perimeter of a quadrilateral is equal to the sum of the lengths of the sides. The perimeter of a square with side s is $4s$.



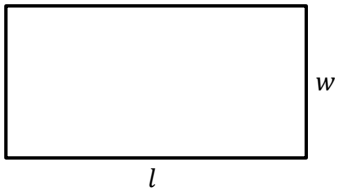
The perimeter of both quadrilaterals is _____

AREA

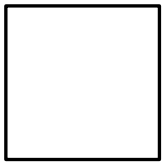
Area of a square - lw



Area of a rectangle - lw



If the perimeter of the rectangle above is 30, what is the area? _____



If the perimeter of the square above is 28, what is the area? _____

TRAPEZOID

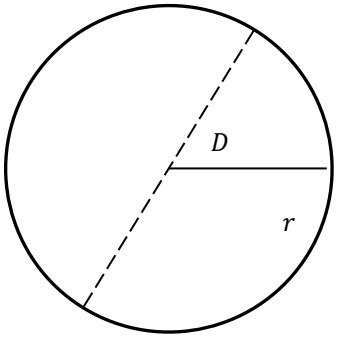
PARALLELOGRAM

A quadrilateral with both pairs of opposite sides parallel is called a parallelogram. In a parallelogram, opposite sides have equal length, and opposite interior angles have equal measures. A quadrilateral with one pair of opposite sides is called a trapezoid.

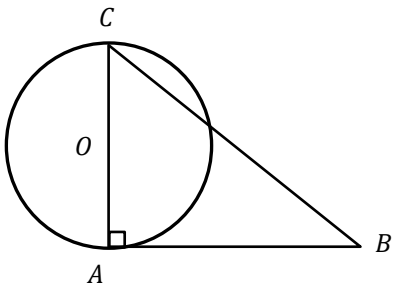
REMEMBER: FOR ALL RECTANGLES AND PARALLELOGRAMS, THE AREA IS $base\ x\ height$**.**

CIRCLES

Area of a circle (A) $= \pi r^2$
Circumference $= 2\pi r$
Diameter $= 2r$
Radius $= \frac{d}{2}$



- What is the area of circle with a radius of 10? _____
- What is the radius of a circle with area of 144π? _____
- What is the circumference of a circle with an area of 81π? _____
- If a circle has a diameter of 6, what is its circumference? _____
- What is the diameter of circle with an area of 100π? _____
- If a circle has a radius of π, what is its area? _____



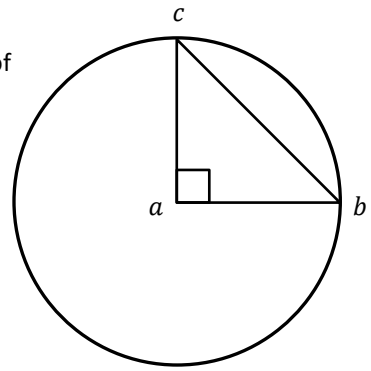
14 If chord CA is the diameter of circle O, and circle O has an area of 144π, what is the area of isosceles right ΔABC?

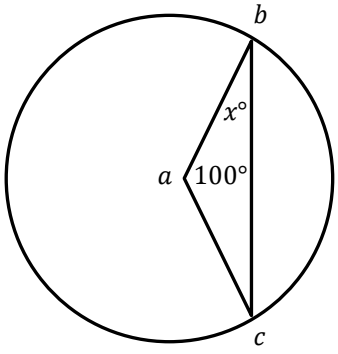
(A) 12 (B) 24 (C) 48 (D) 144 (E) 288

16 If the area of circle O (right)is 9π, and ab and ac are radii of circle O, what is the area of ΔABC?

(A) π (B) 4.5 (C) 9 (D) 9π

(E) 81π





15 If ab and ac are radii of the circle above, what is the value of x?

(A) 30 (B) 40 (C) 45 (D) 50 (E) 55

EXPANDED TOPICS

DIRECT/INVERSE VARIATION

In direct variation questions, as one quantity grows or decreases, the other quantity grows or decreases by the same factor. Think proportions. So if two euros equal three dollars, then 4 euros would equal 6 dollars, and one euro would equal a dollar fifty.

9 If x and y are directly proportional, and when the value of x is 10, the value of y is -5, what is the value of y when $x = 3$?

(A) $\frac{3}{10}$

(B) $-\frac{3}{10}$

(C) $\frac{2}{3}$

(D) $\frac{3}{2}$

(E) $-\frac{3}{2}$

Inverse variation means that as one quantity grows the other quantity decreases, and vice versa. The RTD formula is a great example. If a car averages 60 miles per hour to travel 240 miles, it takes 4 hours. If the car travels twice as fast, it would take half as long. A good formula for indirect proportions is $x_1y_1 = x_2y_2$.

5 If y is inversely proportional to x, and $y = 15$ when $x = 5$, what is the value of y when $x = 25$?

(A) $\frac{1}{5}$

(B) 1

(C) 3

(D) 5

(E) 75

DOMAIN & RANGE

The domain of a function is the set of all possible inputs to a function. For example, the domain of $f(x) = \frac{1}{(x-3)(x-4)}$ is all real numbers except 3 and 4, because either of these numbers would result in a denominator of zero. The range of a function is the set of all possible outputs of a function. For example, the range of $f(x) = x^2$ is the set of all real numbers greater than or equal to zero, because any real number squared must be greater than or equal to zero. Working backwards works great on many function problems.

7 If $f(x) = \frac{1}{(x)(x+7)}$, which of the following represents the domain of $f(x)$?

(A) $\{x \neq 0\}$

(B) $\{x \neq 7\}$

(C) $\{x \neq -7\}$

(D) $\{x \neq 0, -7\}$

(E) All real numbers

8 If $f(a) = a^2 + 4$ which of the following is a possible value of $f(a)$?

(A) -4

(B) 0

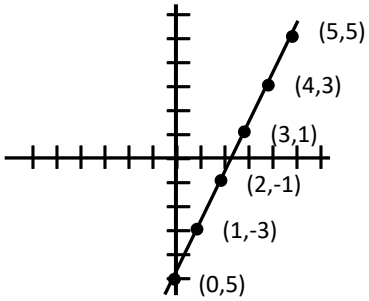
(C) 2

(D) 3

(E) 5

GRAPHING FUNCTIONS

The good news is you won't have to actually graph any functions on the SAT. You will have to answer questions which test whether you understand the relationship between a function and its graph. In a function problem, an arithmetic operation is defined. For example, $f(x) = 2x - 5$. You need to know that the independent variable x is on the x-axis, and the independent variable $f(x)$ is on the y axis.



8 The graph of $y = g(x)$ is shown below. If $g(2) = k$, which of the following could be the value of $g(k)$?

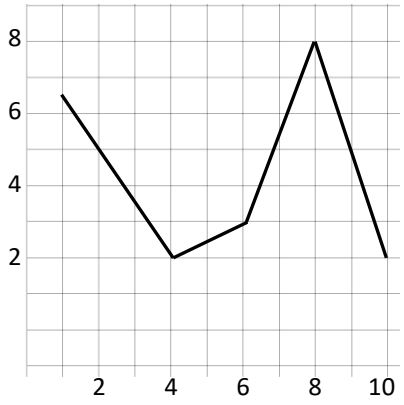
(A) 2

(B) 2.5

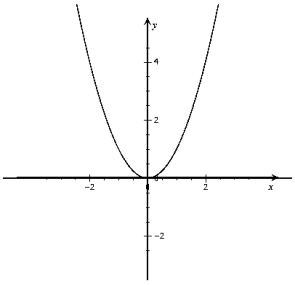
(C) 3

(D) 3.5

(E) 5

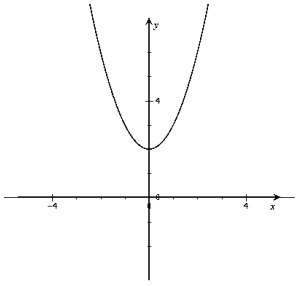


There may be a question or two which require you to know how the graph of a function shifts if you add a value to it. Below is the graph of $f(x) = x^2$.

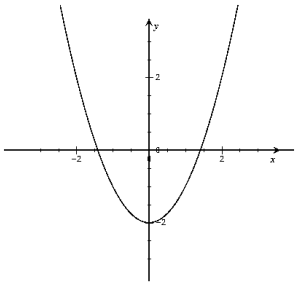


$f(x) = x^2$

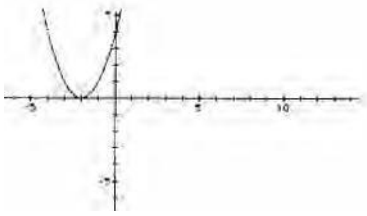
Here's what happens when you manipulate the function:



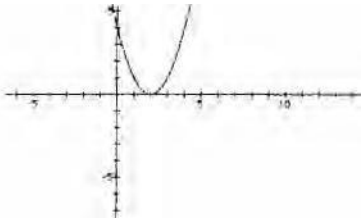
$(fx) + 2$, the graph shifts up 2



$f(x) - 2$, the graph shifts down 2



$f(x + 2)$, the graph shifts 2 to the left



$f(x - 2)$, the graph shifts 2 to the right

ODDS & ENDS

WEIRD FUNCTIONS

When you study functions in school, you think in terms of $f(x)$ or "$f\ of\ x$." On the SAT or ACT, function problems are occasionally tested with bizarre symbols used to represent an arithmetic operation. Functions test your ability to follow directions.

Functions are found in groups of two or three questions, although they occasionally show up alone. If there is a single function problem, its difficulty is determined by its question number. If there are two, the first will be easy and second medium to difficult. If there are three, they will be easy, medium, and difficult. Difficult functions will almost always have bait so be careful.

Let # be defined by the equation $a!\,b = a \cdot b + a - b$

11 $3\,!\,4 =$

(A) 7 (B) 11 (C) 12 (D) 17 (E) 22

12 If $7\,!\,h = 55$, then $h =$

(A) 8 (B) 9 (C) 10 (D) 11 (E) 12

Questions 16-17 refer to the following definition:

For all real numbers p and q

$$\overline{p}\underline{q} = 2pq - (p + q)$$

16 $\overline{5}\underline{4} =$

(A) 6 (B) 11 (C) 31 (D) 39 (E) 49

17 Which of the following must be true for all real numbers p and q

I. $\overline{p}\underline{q} = \overline{q}\underline{p}$

II. $\overline{0}\underline{q} = 0$

III. $\overline{p}\underline{q} = 2p(p - 1)$

(A) I only

(B) II only

(C) III only

(D) I and III only

(E) I, II, and III

9 If $\boxed{x}$ is defined by $\boxed{x} = x$ divided by $(x - 4)$, then $\boxed{8} =$

(A) 1/2 (B) 1 (C) 2 (D) 3 (E) 4

PATTERNS

1st Row	0 1 0
2nd Row	0 1 1 0
3rd Row	0 1 2 1 0
4th Row	0 1 3 3 1 0
5th Row	0 1 4 6 4 1 0
6th Row	

14 The nonzero numbers above form a triangular array. Beginning with the second row, each nonzero number in a row is the sum of the nearest two numbers to it in the numbers immediately above. If a sixth row is added in this fashion, what will be the sum of all the numbers in the sixth row?

(A) 8 (B) 10 (C) 16 (D) 32 (E) 64

1st Row	1
2nd Row	$3+3$
3rd Row	$5+5+5$
4th Row	$7+7+7+7$
5th Row	$9+9+9+9+9$

12 In the pattern of sums shown above, each row is the sum of identical integers. Each new row contains the next consecutive odd integer. For example, Row 6 will contain the integer 11, Row 7 will contain the integer 13, and so on. If the number of integers in each new row is one more than in the row that immediately precedes it, what is the sum of the integers in row 10?

(A) 153 (B) 171 (C) 190 (D) 210 (E) 231

16 What day of the week is the 2,824 day after a Tuesday?

(A) Sunday

(B) Monday

(C) Thursday

(D) Friday

(E) Saturday

17 In the land of Rad, the Holiday of the Harvest Moon is always celebrated on the third Monday in September. The earliest day in September that the holiday could occur is

(A) Sept. 14 (B) Sept. 15 (C) Sept. 20 (D) Sept. 21

(E) Sept. 22

10 Several people are standing in a straight line. Starting at one end of the line, Bill is counted as the fifth person, and, starting at the other end, he is counted as the 12th person, How many people are in the line ?

(A) 15 (B) 16 (C) 17 (D) 18

(E) 19

PROBABILITY

Probability is a mathematical expression of the likelihood of an event. Simply put, the probability of an event occurring is the number of times the desired result occurs divided by the total number of possible outcomes. For instance, when you roll one die, there are six possible outcomes. The chance of rolling a 3 has a one in six probability. The probability of rolling either a 3 or a 4 is two out of six.

16 One card is picked randomly from 20 cards numbered from 1 to 20. What is the probability that the card chosen has 2 digits?

(A) 1/52 (B) 9/20 (C) 1/2 D) 11/20

(E) 1/10

19 One side of a fair coin has the numeral 1 written on it and the other side has the numeral 2 written on it. If the coin is tossed three times, and the numeral that lands up is recorded each time, what is the probability that the sum of the 3 tosses is at least four?

(A) 1/8 (B) 1/4 (C) 1/2 (D) 3/4

(E) 7/8

PERMUTATIONS

A permutation is an arrangement of objects in a definite order. (How many different arrangements of trees can be planted in a row if there are seven different types of tree?) To solve permutation questions, draw a box for each of the positions to fill, and write the number of objects available to fill each box. With the tree example, there are seven trees available for the first position, but only six available when you get to the second position, and so on.

$$\boxed{7}\ \boxed{6}\ \boxed{5}\ \boxed{4}\ \boxed{3}\ \boxed{2}\ \boxed{1}$$

One you've filled in the boxes, multiply the numbers together to determine the total number of possible arrangements, or permutations: $7 \bullet 6 \bullet 5 \bullet 4 \bullet 3 \bullet 2 \bullet 1 = 5{,}040$. This number is known as 7!, or 7 factorial.

COMBINATIONS

If the order in which the objects are chosen makes no difference, it is a combination question. For example, if you were to make an omelet and could choose three of the following ingredients (cheese, ham, bacon, mushrooms, and peppers), the order of ingredients doesn't matter. Cheese, bacon, and ham is the same as ham, bacon and cheese. To answer combination questions, throw out duplicate answers that count as separate permutations, but not as separate combinations. Use the boxes again: For the first ingredient, there are five choices. For the second, there are four remaining possibilities. And for the third, there are three.

$$\boxed{5}\ \boxed{4}\ \boxed{3}$$

So there are 60 possible *permutations* ($5 \bullet 4 \bullet 3 = 60$). But these will include duplicates. Next, get rid of duplicates by dividing by the possible permutations by the number of positions, factorial. $3 \bullet 2 \bullet 1 = 6$. $60 \div 6 = 10$. So there are ten possible combinations.

13 A security system uses a four-letter password, but no letter can be used more than once. How many possible passwords are there?

(A) 26 (B) 520 (C) 15,600 (D) 358,800 (E) 717,600

15 There are 12 students in the school theater class. Two students will be responsible for finding the props needed for the school play. How many different pairs of students can be chosen to find the props?

(A) 264 (B) 132 (C) 66 (D) 54 (E) 28

GRAMMAR

The raw score from SAT Writing section is combined with the raw score from the Reading Test and then converted to the 200-800 scale for the SAT Reading and Language score. ACT English Test is scaled on the same 1-36 scale as the other sections. If you understand the most common mistakes tested on the grammar sections, your work is almost done. Here are the five most commonly tested errors.

VERB AND TENSE AGREEMENT

Verbs and nouns must agree with each other. Singular nouns must take singular verbs. Plural nouns must take plural verbs. Verbs must be conjugated to reflect when the action takes place. Often, phrases or clauses will tell you when the action takes place. Bracketing is very helpful when checking verb tense agreement.

12 As the potter removes one brick at a time to create an opening into the oven, an expanding view of gleaming shapes <u>reward</u> the artist for the months of hard work.

3 A. NO CHANGE
B. rewards
C. rewarding
D. as a reward for

13 As the dancers step to the music, <u>they were also stepping</u> in time to a sound that embodies their unique history.

3 A. NO CHANGE
B. are also stepping
C. have also stepped
D. will also step

PRONOUNS AND NOUNS

Make sure that pronouns which are underlined agree with the nouns which they replace. Check to see if they are the same number, gender and case as the nouns they replace. If a sentence seems like it is missing something, check for pronouns. If nouns and pronouns are side by side, one is usually unnecessary.

14 In the long run, the extermination of a predator like the gray wolf may actually harm, not help, <u>their</u> natural prey.

9 A. NO CHANGE

B. it's

C. its

D. there

17 A curator at the science museum indicated that an unusually high percentage of <u>its</u> holdings results directly from funds donated to it by wealthy patrons.

3 A. NO CHANGE

B. his

C. it's

D. there

DICTION AND IDIOM

Idioms refer to using the correct word at the correct time. It is better to say "I am happy for you," than to say "I am happy by you." There is no rule, which governs word choice in these prepositional phrases. If a preposition is underlined on the error identification section and it just doesn't sound right, it's probably a mistake in idiom.

Social scientists agree that a system to exchange goods for services is not only present but necessary in all societies.

3 A. NO CHANGE

B. of exchanging goods

C. for exchanging

D. by exchanging

Diction will be tested on the grammar sections by way of word choice. For example, what's wrong with this sentence:

I'm really aggravated by my girlfriend.

HERE ARE SOME OTHERS TO WATCH FOR:

Principle	Principal
Stationary	Stationery
Accept	Except
Persecute	Prosecute
Eminent	Imminent
Allusion	Illusion
It's	Its
They're	Their
Affect	Effect
Proscribe	Prescribe
Incredible	Incredulous
Illicit	Elicit
Further	Farther

QUANTITY AND COMPARISON

COUNTABLE NOUNS USE THE WORDS MANY, FEWER, OR NUMBER

There are many restaurants in the city.

I have fewer dogs than I have cats.

There are a number of ways to get to town.

NON-COUNTABLE NOUNS USE THE WORDS MUCH, LESS, OR AMOUNT.

There's not much time until the holidays.

The stove uses less electricity than the refrigerator.

No amount of luck can replace preparation.

USE THE –ER ENDING OR "BETWEEN" WHEN COMPARING TWO THINGS.

I am taller than you.

Don't get between a rock and a hard place.

USE THE –EST ENDING OR "AMONG" IF YOU HAVE MORE THAN TWO THINGS.

She is the tallest student in the class.

There was consensus among the five senators.

THE BEST OF THE REST

CONJUNCTIONS:

I'm not watching "The Simpsons" tonight for I am teaching.

COMPARISON:

The students at Angevine Middle School are smarter than Louisville Middle School.

MISPLACED MODIFIERS:

Long thought to live only in New Mexico, scientists have discovered the three-toed gecko in parts of Nevada.

REDUNDANCY:

I got done working at 9 a.m. in the morning.

SENTENCE FRAGMENT:

Since I met Alice, who happened to be the stupidest person in the world.

DOUBLE NEGATIVE:

You can't hardly walk down Pearl Street without being accosted for money.

AMBIGUITY:

I saw Lisa and Rachael yesterday, and she looked like crap.

DRILLS

Identify the mistakes in the following questions:

Brought to the US at the age of 5, the childhood of John Kepman was difficult.

Easting fruits and vegetables is healthier than meat.

Walking down the street, a piano hit me on the head.

By the year of 2025, the deficit is expected to be under control.

We couldn't scarcely get to the end of the chapter in one night.

Princeton Review teachers are nerdier than the Full Passages.

Josephine Baker, with a series of notable successes.

OBJECTIVE VS. SUBJECTIVE PRONOUNS.

Between you and *me/ I,* speed traps suck.

That girl, about *who/ whom* I was talking, just walked by.

You and *I/ me* should look into that idea further.

To get to the beach as quickly as possible, you should follow Annette and *me/ I.*

To *who/ whom* do you think you're talking?

DRILLS

PRONOUNS AGREEMENT:

Nobody who saw game 6 of the Lakers series can say *they were / he was* bored.

When one lives in a glass house*, you / one* shouldn't throw stones.

If the police department framed O.J., *it / they* must have been crazy.

SUBJECT / VERB AGREEMENT:

None of us *is / are* responsible for another's actions.

Either Michael Jordan or Joe Montana *are / is* the most valuable commodity in television.

Neither of us *are / is* going to school today.

Either of the two pilots who jumped form the plane *are / is* going to die; one of the parachutes is faulty.

That group of skinheads that *hangs* / *hang* out in front of my office *pisses / piss* me off.

VERB TENSE:

Until last year, Scott had *swum / swam* only once competitively.

Yesterday, I *lay / lie* in my backyard.

Today, I will *lay / lie* in my backyard.

If I *were / was* king, I'd kick a little ass.

Nedra was such a popular teacher that her phone *rung / rang* constantly.

PUNCTUATION

COMMAS

Commas are the culprit on more than half of the punctuation questions. In general, fewer commas are better than more. Usually, the only time when an answer with the most commas is correct is when the sentence contains "unnecessary" information in the middle of a sentence.

I saw my swim coach, Bill Dench, at the mall yesterday, vs. I saw my swim coach at the mall yesterday.

Commas are inserted where you'd naturally pause when speaking. Here are some concrete rules.

Rule #1, Series comma:

Alfred likes to photos of subjects as diverse as anthills, construction sites, sea anemones, car accidents, jailers turning on electric chairs and his sister.

Just remember that you need commas after every item in the series, even the last one. As written, the jailers would be turning on Alfred's sister- which we hope isn't what Alfred wants to take pictures of.

Rule # 2, Separating clauses or phrases

Independent clauses are the parts of a sentence which, if removed, can stand on their own right as complete sentences. *Dumb Tony wondered if he could fit his pinky finger into the light socket.* A dependent clause cannot stand on its own. *Before being rushed to the emergency room*. If you were to put these to clauses together, you'd need a comma to separate them.

Before being rushed to the emergency room, *Dumb Tony wondered if he could fit his pinky finger into the light socket.*

A modifying phrase describes something else in the sentence, usually a noun. An independent clause and a modifying phrase also need to be separated by a comma.

Dazed and confused after finishing ninth grade, Tony decided to try a little harder the second time though.

Rile #3, Separating non-essential modifiers

A non-essential modifier is an incidental modifier which could be removed from a sentence without drastically changing the meaning of the sentence.

Two of my cats, the white one and the black one, dragged a pheasant through the window and into my apartment.

SEMICOLONS

Think of a semicolon as being somewhere between a comma and a period. They join two closely related independent clauses. They could be replaced by a comma and the word and, or simply a period, but the semicolon serves the same purpose.

Jimmy the Fish ratted out his partner; Jimmy now sleeps with the fishes.

The English section of the ACT has five 15-questions passages to read in 45 minutes, with parts of them underlined. The SAT has four 11-question passages (35 minutes). You will be asked whether a particular underlined section should be changed to one of the answer choices, or if it is already written in the best form.

APOSTROPHES

Apostrophes are used to signify possession. If the noun is singular, simply add 's. If the noun is plural, just add the apostrophe to the plural noun.

My cat's fat butt seems to grow bigger every day.

My brown and white cats' chew toys are disgusting.

RHETORICAL QUESTIONS

There are some questions on the grammar sections of the SAT and ACT which test your ability to edit an essay. They will ask you if a sentence should be kept or deleted, what the correct placement of a sentence might be, which answer choice is the most logical opening sentence of a paragraph should be, etc. The key to these questions is to choose answer choices which logically follow what comes before or after the sentence in question. If they ask if a sentence should be kept or deleted, make sure the sentence is absolutely necessary. For sentence placement, look before and after; one of those sentences will show you which answer choice logically fits best. For the opening sentence in a paragraph, read the rest of the paragraph and see where it leads. Choose the answer choice which introduces the rest of the paragraph. Most important, though, is to make sure you always read the questions. Some actually ask which answer choice is wrong. Skipping the questions and just looking at the answer choices is a fatal mistake. Don't be lazy and fall into a trap.

PLAN OF ATTACK

TWO PASS:

If you come across a question that looks difficult or confusing, skip it, and come back if you have time. Avoid "bottomless pit" questions.

BRACKETING GARBAGE:

Often, phrases and clauses are included solely to distract you. Putting brackets around garbage can help. For example:

> A group of Colombo monkeys, long thought to live only in the Serengeti, have been found in other parts of Africa as well.

If you eliminate the garbage you're left with: A group have been found (clearly wrong)…eliminating garbage helps you locate the meat of the sentence.

APPROACH TO ENGLISH AND WRITING:

1. FIND THE SUBJECT AND VERB – DO THEY MATCH?

2. CHECK UNDERLINED PRONOUNS – PROPER CASE? AMBIGUOUS? DO THEY AGREE?

3. IS THERE COMPARISON? IS IT PARALLEL?

4. ARE ADVERBS OR ADJECTIVES UNDERLINED?

5. ARE THERE DOUBLE NEGATIVES OR REDUNDANCIES?

6. A LITTLE MORE THAN ONE-FOURTH OF THE TIME, (A) NO ERROR, IS CORRECT

7. SHORT IS SWEET. THE SHORTER ANSWERS HAVE A HIGHER CHANCE OF BEING CORRECT.

8. AVOID…ING. CONSTRUCTIONS WITH WORDS ENDING IN (...ING) ARE USUALLY INCORRECT.

9. DON'T FORGET TO READ THE QUESTION! IT'S EASY JUST TO LOOK AT THE ANSWERS AND PASS OVER THE QUESTIONS. BAD MOVE. SOME QUESTIONS ARE ASKING FOR THE WRONG ANSWER (WHICH CHOICE IS INCORRECT). ON THE RHETORICAL QUESTIONS, THE QUESTIONS WILL GIVE YOU GREAT CLUES AS TO THE CORRECT ANSWER.

THE ESSAY

You don't have to be a great writer to get a great score on the SAT or ACT essay. Even if you were a great writer, how are you supposed to get that across in a 40-50-minute essay? Stick with the strategies you'll learn and practice them, and you'll breeze through this part of the test.

WRITE A TRADITIONAL 5-7 PARAGRAPH ESSAY

The readers responsible for grading your essay are told to grade the essay holistically, overlooking small grammatical errors or misspellings to focus on the big picture. They are supposed to judge you on organization and the development of ideas. They typically have only a couple of minutes to grade each essay, and they grade hundreds of essays every day. Make it easy for them. A traditional 5-7-paragraph essay just screams organization. Use the first as an introduction, use each of the body paragraphs to support your position through examples, and use the final to restate and conclude.

FILL THE SPACE

There is a very strong correlation between essay length and score. Longer essays imply that you have something to say. Try not to repeat yourself or add obvious BS to lengthen your essay. Add another example or expand on a previous one. Make sure to INDENT clearly so that the reader knows that you're not only voluminous, but organized.

KISS – KEEP IT SIMPLE, STUPID

Long, rambling sentences make your essay convoluted and can lose your audience. Keep your sentences short and sweet, but mix things up with some good transitions. Make sure you stay on topic. Drop in a few "five dollar" vocab words, but make sure you use them correctly. Don't offend the reader! Stay away from extreme viewpoints, political or otherwise.

BE NEAT

No, they're not supposed to grade you on your handwriting, but let's face it. If they can't read it, they're not going to assume it deserves a six. If you have bad handwriting, consider writing bigger, printing, or as a last resort, printing in block letters. Follow the rules for proper essay writing. For example, underline the name of a novel, or put shorter works, like poems in quotations.

THE ACT ESSAY

The formats for the SAT and ACT essays are different. The SAT asks you to critique a persuasive text. The ACT asks you to choose a side in a logical argument and defend it. The scoring of the ACT essay consists of two readers giving the essay a score of 1-6. If there is a difference of more than 1 point, a third reader is brought in to break the tie. The final score combines the two and students get scores on a 2-12 range.

Here's an example of an ACT essay prompt.

Planning Your Essay

Your work on these prewriting pages will not be scored.

Use the space below and on the back cover to generate ideas and plan your essay. You may wish to consider the following as you think critically about the task:

Strengths and weaknesses of different perspectives on the issue
- What insights do they offer, and what do they fail to consider?
- Why might they be persuasive to others, or why might they fail to persuade?

Your own knowledge, experience, and values
- What is your perspective on this issue, and what are its strengths and weaknesses?
- How will you support your perspective in your essay?

Intelligent Machines

Many of the goods and services we depend on daily are now supplied by intelligent, automated machines rather than human beings. Robots build cars and other goods on assembly lines, where once there were human workers. Many of our phone conversations are now conducted not with people but with sophisticated technologies. We can now buy goods at a variety of stores without the help of a human cashier. Automation is generally seen as a sign of progress, but what is lost when we replace humans with machines? Given the accelerating variety and prevalence of intelligent machines, it is worth examining the implications and meaning of their presence in our lives.

Read and carefully consider these perspectives. Each suggests a particular way of thinking about the increasing presence of intelligent machines.

Perspective One

What we lose with the replacement of people by machines is some part of our own humanity. Even our mundane daily encounters no longer require from us basic courtesy, respect, and tolerance for other people.

Perspective Two

Machines are good at low-skill, repetitive jobs, and at high-speed, extremely precise jobs. In both cases they work better than humans. This efficiency leads to a more prosperous and progressive world for everyone.

Perspective Three

Intelligent machines challenge our long-standing ideas about what humans are or can be. This is good because it pushes both humans and machines toward new, unimagined possibilities.

Essay Task

Write a unified, coherent essay about the increasing presence of intelligent machines. In your essay, be sure to:

- clearly state your own perspective on the issue and analyze the relationship between your perspective and at least one other perspective
- develop and support your ideas with reasoning and examples
- organize your ideas clearly and logically
- communicate your ideas effectively in standard written English

Your perspective may be in full agreement with any of those given, in partial agreement, or completely different.

Here's how to attack the ACT essay. First, figure out which of the three arguments you agree with most. Read the three options and pick the one that strikes you as the most obviously correct. You are not going to be graded based on which side you pick. All three are there for a reason – they're all equally valid in the minds of the test maker and the test grader. All you need to do is pick the one that seems most correct to you.

Next, write a single sentence that summarizes of the perspective you've chosen. From the example prompt above, let's summarize Perspective Two: Advanced machines will make the world a better place.
Next, write a single sentence summarizing the other two perspectives.

- Perspective One: New machines make us worse people and get rid of our humanity.

- Perspective Three: New machines will push and challenge humanity in a beneficial way.

Next, come up with one positive example for each of the three perspectives.

- Advanced machines will make the world a better place. Example: New machinery can harvest more food at farms more cost-effectively, which means that underprivileged people will have more food, and everyone will be able to eat more affordably.

- New machines make us worse people and get rid of our humanity. Example: Cell phones facilitate cyber-bullying in middle and secondary schools.

- New machines will push and challenge humanity in a beneficial way. Example: New machines help patients recover during rehabilitation from strokes leading to faster, more effective recoveries.

You have two goals with this essay. The first is to pick and prove your point. The second is to analyze and then discredit the other two points. You need to be fair and acknowledge the validity of the other points of view – but you also need to show that the other perspectives are flawed. Come up with one more positive example for the perspective you chose, and one negative example for each of the two perspectives remaining.

Advanced machines will make the world a better place. Example: New machine can do the most dangerous jobs at car assembly plants, so workers aren't recklessly endangered while working at assembly factories.

- New machines make us worse people and get rid of our humanity. Counter example: Skype and similar platforms allow people to stay in touch across great distances. In some ways new machines are bad, but they do have some merit.

- New machines will push and challenge humanity in a beneficial way. Counter example: Machines will put lots of people out of work. The same machine that makes work less dangerous will also put people out of work.

You now have your thesis, summaries of all the perspectives, two examples to support your thesis, and both a confirming and a contradictory example for the other two points. Now it's time to write.

Keep the format simple. In your opening paragraph, summarize the question asked and the three perspectives provided. For the next two paragraphs, take each of the perspectives you didn't choose, and provide the positive and negative examples you brainstormed earlier and conclude that there are better alternatives. Next, provide the two positive examples you had for the perspective you chose, and

conclude that your perspective is the best. Finally, write a conclusion summarizing the previous three paragraphs.

THE SAT ESSAY

Here's an example of an SAT essay prompt.

As you read the passage below, consider how Jimmy Carter uses

- evidence, such as facts or examples, to support claims.
- reasoning to develop ideas and to connect claims and evidence.
- stylistic or persuasive elements, such as word choice or appeals to emotion, to add power to the ideas expressed.

Adapted from former US President Jimmy Carter, Foreword to *Arctic National Wildlife Refuge: Seasons of Life and Land, A Photographic Journey* by Subhankar Banerjee. ©2003 by Subhankar Banerjee.

1 The Arctic National Wildlife Refuge stands alone as America's last truly great wilderness. This magnificent area is as vast as it is wild, from the windswept coastal plain where polar bears and caribou give birth, to the towering Brooks Range where Dall sheep cling to cliffs and wolves howl in the midnight sun.

2 More than a decade ago, [my wife] Rosalynn and I had the fortunate opportunity to camp and hike in these regions of the Arctic Refuge. During bright July days, we walked along ancient caribou trails and studied the brilliant mosaic of wildflowers, mosses, and lichens that hugged the tundra. There was a timeless quality about this great land. As the never-setting sun circled above the horizon, we watched muskox, those shaggy survivors of the Ice Age, lumber along braided rivers that meander toward the Beaufort Sea.

3 One of the most unforgettable and humbling experiences of our lives occurred on the coastal plain. We had hoped to see caribou during our trip, but to our amazement, we witnessed the migration of tens of thousands of caribou with their newborn calves. In a matter of a few minutes, the sweep of tundra before us became flooded with life, with the sounds of grunting animals and clicking hooves filling the air. The dramatic procession of the Porcupine caribou herd was a once-in-a-lifetime wildlife spectacle. We understand firsthand why some have described this special birthplace as "America's Serengeti."

4 Standing on the coastal plain, I was saddened to think of the tragedy that might occur if this great wilderness was consumed by a web of roads and pipelines, drilling rigs and industrial facilities. Such proposed developments would forever destroy the wilderness character of America's only Arctic Refuge and disturb countless numbers of animals that depend on this northernmost terrestrial ecosystem.

5 The extraordinary wilderness and wildlife values of the Arctic Refuge have long been recognized by both Republican and Democratic presidents. In 1960, President Dwight D. Eisenhower established the original 8.9 million-acre Arctic National Wildlife Range to preserve its unique wildlife, wilderness, and recreational values. Twenty years later, I signed the Alaska National Interest Lands Conservation Act, monumental legislation that safeguarded more than 100 million acres of national parks, refuges, and forests in Alaska. This law specifically created the Arctic National Wildlife Refuge, doubled the size of the former range, and restricted development in areas that are clearly incompatible with oil exploration.

6 Since I left office, there have been repeated proposals to open the Arctic Refuge coastal plain to oil drilling. Those attempts have failed because of tremendous opposition by the American people, including the Gwich'in Athabascan Indians of Alaska and Canada, indigenous people whose culture has depended on the Porcupine caribou herd for thousands of years. Having visited many aboriginal peoples around the world, I can empathize with the Gwich'ins' struggle to safeguard one of their precious human rights.

7 We must look beyond the alleged benefits of a short-term economic gain and focus on what is really at stake. At best, the Arctic Refuge might provide 1 to 2 percent of the oil our country consumes each day. We can easily conserve more than that amount by driving more fuel-efficient vehicles. Instead of tearing open the heart of our greatest refuge, we should use our resources more wisely.

8 There are few places on earth as wild and free as the Arctic Refuge. It is a symbol of our national heritage, a remnant of frontier America that our first settlers once called wilderness. Little of that precious wilderness remains.

9 It will be a grand triumph for America if we can preserve the Arctic Refuge in its pure, untrammeled state. To leave this extraordinary land alone would be the greatest gift we could pass on to future generations.

Write an essay in which you explain how Jimmy Carter builds an argument to persuade his audience that the Arctic National Wildlife Refuge should not be developed for industry. In your essay, analyze how Carter uses one or more of the features listed in the box above (or features of your own choice) to strengthen the logic and persuasiveness of his argument. Be sure that your analysis focuses on the most relevant features of the passage.

Your essay should not explain whether you agree with Carter's claims, but rather explain how Carter builds an argument to persuade his audience.

The SAT scoring system works this way: Two readers will score your Essay separately and assign a score of 1 to 4 for each of three sections that include Reading, Analysis, and Writing. The two reader's scores are then added together. SAT Essay score reports provide these three separate scores, each on a 2 to 8 scale.
For example, a possible score combination would be 7 Reading / 7 Analysis / 8 Writing.

Your Reading score will reflect how well your essay shows that you understood the passage. Your Analysis score will reflect how well your essay analyzes how the author went about persuading the audience. Finally, your Writing score will reflect the cohesiveness of your essay as well as how well it demonstrates a command of language and the conventions of standard written English.

Here's how to attack the SAT essay. Start by reading the essay one time through to get a general feel for the author's argument. Next, read it again and try to identify three different rhetorical tools the author uses in support of his main idea and provide examples of each tool. Circle or underline examples as you're reading. When you write your essay, devote one body paragraph to each.

One rhetorical tool that an author can use is appeal to authority- the author either writes in a way or has credentials to convince you that he knows what he is talking about. Another is appeal to emotions- the author uses examples or word choice to emotionally convince you that his argument is correct. Finally, appeal to logic- the author makes a logically convincing case that his argument is sound.

After you have read and annotated the essay, it's time to begin writing. Spend a few minutes coming up with an outline. Your first paragraph should be a traditional introduction. Each of the three body paragraphs should examine the author's three rhetorical devices. The final paragraph should be the conclusion.

Remember to use several examples from the text, fill at least 3-4 pages in the testing booklet, have strong transitions, and sprinkle some impressive vocabulary along the way.

CRITICAL READING

Most people think that critical reading is the worst part of the SAT and ACT. It doesn't have to be that way. Critical reading is actually one of the easiest parts of the tests, because most of the answers are located in the passage, and there is rarely any difficulty vocabulary.

Unless you are already scoring above 550 on the SAT, or 27 on the ACT, or are really good at reading these passages, you should leave at least some of the questions in each section for guessing.

HERE ARE THE MOST COMMON MISTAKES TO AVOID:

READING TOO CLOSELY

If you find yourself reading the same sentence or words over and over again, or if you finish a passage and then have no clue about what you just read, you've probably tried to read too carefully. To answer the majority of questions on this section, you only need to have a general idea about what is going on. You should skim for ideas and look back closely for details.

READING THE QUESTIONS FIRST

This is a huge waste of valuable time. At best, reading the questions first will give you a general idea about the passage. At worst, it can confuse the heck out of you.

UNDERLINING IMPORTANT INFORMATION

Nothing is important on critical reading until they ask a question about it. Underlining "important" information almost forces you to use it as the answer to a question, whether it is the correct answer or not.

ANSWERING QUESTIONS BY MEMORY

The one nice thing about critical reading is that most of the answers are located in the passage. If you think you remember specific information, take the extra 30 seconds to double check it with the passage.

READING THE PASSAGE

Different people will tell you different things about critical reading. Sometimes it's good advice, usually it's not. Here's how to attack this section:

GOALS WHEN READING:

- To get a general idea of what the passage is about
- To learn roughly where specific information is located

To answer most general questions, you only need to have a general idea about what the passage is about. For instance, Home Alone is a story about a kid whose parents ditch him and how he makes life difficult for some really stupid criminals. Specific questions tend to be so specific that you need to look back to the passage for the information anyway.

INTRODUCTION

A brief introduction written in italics appears before all critical reading passages. It tells you what the passage is about and sometimes defines difficult terms. Don't blow it off. It helps direct you toward the main idea.

> *The passages below are drawn from two articles that discuss the phenomena of the aurora borealis, or Northern Lights.*
>
> *America's rise to industrial supremacy in the late nineteenth century was more gradual than many believe. The following article by Charles Fletcher focuses on the growth of American industry in the period before the Civil War.*

TOPIC SENTENCES

Critical reading passages chosen for the SAT and ACT are predictable. They tend to be "classically" written. In other words, each contains a thesis, topic sentences, and a conclusion. Reading the first two sentences of each paragraph and the last sentence of the entire passage will usually tell you what you need to know. If reading the first sentence doesn't help, try the next ones. As soon as you know what a paragraph is about, skip to the next one. Remember, your goal is to answer the questions correctly – not to "comprehend" the passage.

CLUE WORDS

On reading comprehension, certain words are used to trigger where important information is located. When you read the passage the first time, you should circle clues and read the sentences that contain them. The following is a list of trigger words:

But	**However**
Despite	**Therefore**
Moreover	**Yet**
Hence	**Although**
Rather	**In conclusion**

At my family's cabin on a Minnesota lake, I knew woods so dark that my hands disappeared before my eyes. I knew night skies in which meteors left smoky trails across sugary spreads of stars. But now, when 8 of 10 children born in the United States will never know a sky dark enough for the Milky Way, I worry we are rapidly losing night's natural darkness before realizing its worth. This winter solstice, as we cheer the days' gradual movement back toward light, let us also remember the irreplaceable value of darkness.

All life evolved to the steady rhythm of bright days and dark nights. Today, though, when we feel the closeness of nightfall, we reach quickly for a light switch. And too little darkness, meaning too much artificial light at night, spells trouble for all.

Already the World Health Organization classifies working the night shift as a probable human carcinogen, and the American Medical Association has voiced its unanimous support for "light pollution reduction efforts and glare reduction efforts at both the national and state levels." Our bodies need darkness to produce the hormone melatonin, which keeps certain cancers from developing, and our bodies need darkness for sleep. Sleep disorders have been linked to diabetes, obesity, cardiovascular disease and depression, and recent research suggests one main cause of "short sleep" is "long light." Whether we work at night or simply take our tablets, notebooks and smartphones to bed, there isn't a place for this much artificial light in our lives.

The rest of the world depends on darkness as well, including nocturnal and crepuscular species of birds, insects, mammals, fish and reptiles. Some examples are well known—the 400 species of birds that migrate at night in North America, the sea turtles that come ashore to lay their eggs—and some are not, such as the bats that save American farmers billions in pest control and the moths that pollinate 80% of the world's flora. Ecological light pollution is like the bulldozer of the night, wrecking habitat and disrupting ecosystems several billion years in the making. Simply put, without darkness, Earth's ecology would collapse....

In today's crowded, louder, more fast-paced world, night's darkness can provide solitude, quiet and stillness, qualities increasingly in short supply. Every religious tradition has considered darkness invaluable for a soulful life, and the chance to witness the universe has inspired artists, philosophers and everyday stargazers since time began. In a world awash with electric light...how would Van Gogh have given the world his "Starry Night"? Who knows what this vision of the night sky might inspire in each of us, in our children or grandchildren?

Yet all over the world, our nights are growing brighter. In the United States and Western Europe, the amount of light in the sky increases an average of about 6% every year. Computer images of the United States at night, based on NASA photographs, show that what was a very dark country as recently as the 1950s is now nearly covered with a blanket of light. Much of this light is wasted energy, which means wasted dollars. Those of us over 35 are perhaps among the last generation to have known truly dark nights. Even the northern lake where I was lucky to spend my summers has seen its darkness diminish.

It doesn't have to be this way. Light pollution is readily within our ability to solve, using new lighting technologies and shielding existing lights. Already, many cities and towns across North America and Europe are changing to LED streetlights, which offer dramatic possibilities for controlling wasted light. Other communities are finding success with simply turning off portions of their public lighting after midnight. Even Paris, the famed "city of light," which already turns off its monument lighting after 1 a.m., will this summer start to require its shops, offices and public buildings to turn off lights after 2 a.m. Though primarily designed to save energy, such reductions in light will also go far in addressing light pollution. But we will never truly address the problem of light pollution until we become aware of the irreplaceable value and beauty of the darkness we are losing.

DRILL: COME UP WITH YOUR OWN MAIN IDEA.

What is the main idea of this passage?

_____

_____

_____

DIFFERENT TYPES OF MAIN IDEA QUESTIONS

Here are some examples of ways that ETS can ask for the main idea

> The primary purpose of the passage is to…
>
> Which of the following best summarizes the author's main point…
>
> The passage primarily serves to…
>
> The main focus of the passage is on…
>
> Which of the following is the best title for the passage…

These questions are all asking for the main idea. **Important note:** On primary purpose questions focus on the verb.

Getting through the passage fairly quickly and figuring out the main idea is half the battle. Remember, your critical reading skills will improve significantly with practice. We admit these passages aren't great reading, but don't be lazy. Critical reading can be the easiest section on the test.

QUESTION TYPES

GENERAL:

General questions include:

Main Idea (Title)

Primary Purpose

Tone

The important thing to remember with general questions is that they have general answers. General questions encompass the entire passage. Watch out for specific answers when they ask general questions. Your first read – through of the passage should be enough to answer general questions.

SPECIFIC:

According to the author…

According to the passage…

Line number

Inference

Paired questions

The best way to answer specific questions is to look back to the appropriate paragraph and read carefully. **NEVER RELY ON YOUR MEMORY TO ANSWER SPECIFIC QUESTIONS**. Answers to questions are often in sentences with clue words.

Paired Questions

This fairly common SAT question type links two questions together. The first question will be in the traditional format; the second will ask "which choice provides the best evidence for the previous answer". These should be done together. Read the first question, and then go to the "find the evidence" question's answer choice "A". Read the lines noted and see if they answer the previous question. Always check all 4 answer choices.

SPOTTERS

Another good technique for locating specific information is to watch out for "spotters". Spotters are words that are easy to find with a quick skim.

7 The author mentions Ezekiel Cheever as an example of a man characterized by what quality?

The spotter in this question is "Ezekiel Cheever" You should be able to locate the spotter and the answer to this question fairly easily.

DRILL: LOCATE THE SPOTTERS IN THE FOLLOWING QUESTIONS.

3 Which of the following can be inferred from the passage about boys in colonial Massachusetts between 1642 and 1647?

5 The author compares the star-eater with the anglerfish primarily in order to

7 The passage indicates that biomass decreases as ocean depth increase because

BRACKETING

The author discussed nose picking (lines 4-10) primarily in order to…

Bracketing is the way to answer line number questions. If the question provides a line reference, you should read four or five lines before and four or five lines after the line number provided. Surprisingly, the answers to line number questions are often a few lines before or a few lines after the lines provided.

VOCAB IN CONTEXT

Vocab in context questions is among the easiest, so you shouldn't leave any blank. Most times, ETS isn't testing your knowledge of especially difficult words. They are testing you ability to recognize secondary definitions. **THE MOST COMMON DEFINITION OF AN EASY WORD WILL NOT BE THE CORRECT ANSWER ON VOCAB QUESTIONS.**

VOCAB STRATEGY

Step One:	Locate the word or phrase in the passage and circle it.
Step Two:	Read a couple of sentences before, and a couple of sentences after, **looking for clues.**
Step Three:	Decide what you think the word or phrase means.
Step Four:	Eliminate choices that don't work.

PLAN OF ATTACK

TWO PASS SYSTEM

Critical reading questions are not created equal. Some are easier and take less time. Others are more difficult and take longer. The two-pass system will help you maximize your critical reading raw scores. On your first pass through questions, you should skip any that that you find especially difficult or time consuming, These include I, II, or III questions, EXCEPT questions, and long, confusing questions with long, confusing answer choices. “Easy” questions include specific line number questions, tone, and vocab context. Tackle easy questions on your first pass, and if you have time left, try the more difficult ones.

DUAL PASSAGE

Most SAT and ACT tests have dual passages- two separate passages written by different people about the same topic. The first questions relate to the first passage, the next questions relate to the second passage, and the final questions encompass both. The plan of attack for the dual passage is to skim the first passage and two pass the questions related to it, then skim the second and two pass the questions related to it, and if you still have time, answer the questions which relate to both. If you are running out of time after answering the questions related to the first passage, try to answer the vocab in context questions and tone questions for the second.

AVOID EXTREMES

Which of the following statements is easier to disprove?

(A) Everyone loves chocolate ice cream.

(B) Chocolate ice cream is very popular.

Obviously the first one. You only need one person to dislike chocolate ice cream to make statement (A) incorrect. The same is true on the SAT. The correct answer choices usually don't go to extremes but instead stay safely in the middle. Should is better than must.

Here's a list of words to avoid:

only	every	never
prove	all	always
must	cannot	solely

TRY THIS:

The author specifies, "fund-raising, tea boycotts and actions against profiteering merchants" in order to…

(A) prove that women altered the course of the American Revolution

(B) demonstrate how women protested male dominance

(C) point out the only activities available to women during this period

(D) indicate that women only engaged in political activities that directly affected their households

(E) give examples of political activities undertaken by women during the Revolutionary War

SCIENCE REASONING

The Science Reasoning section is unique to the ACT, but the strategies behind this section should help you with the charts and graphs questions on the SAT Reading and Writing and Language. Some people think that the Science Reasoning section is one of the most difficult on the ACT. It doesn't have to be that way. In fact, the section should be called science-based reading comprehension because it requires no outside knowledge of science to answer the questions; you only need to be able to interpret charts and graphs. There are three types of science passages that you'll come across on the ACT and different approaches for each one.

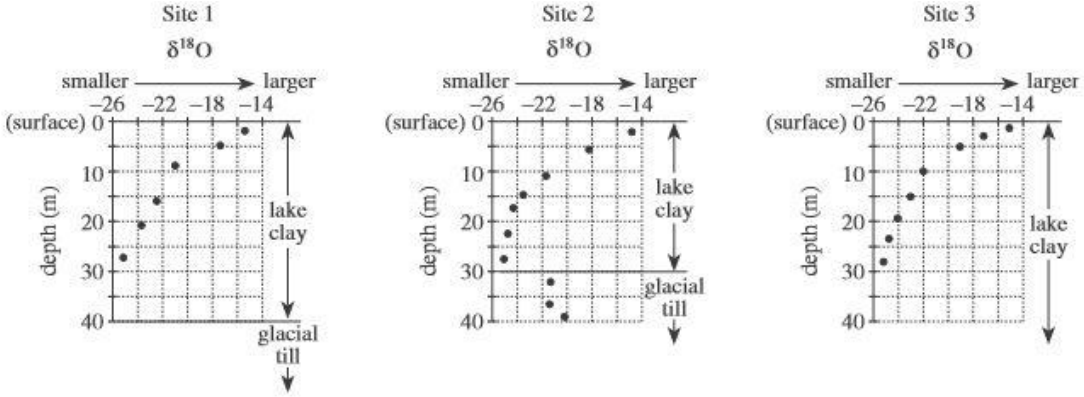
CHARTS AND GRAPHS

Charts and graphs questions are usually among the easiest. Because passages are testing your ability to understand charts, graphs, and tables, don't worry about the introduction. Get straight to the questions. If you come to a question that you can't answer simply by looking at the graph, then you'll need to read the introduction. Make sure you're looking at the correct figure when you're answering the questions. Understand the units being used and the variables on either axis.

Passage II

Lake Agassiz existed between 11,700 and 9,500 years ago in North America (see Figure 1). The lake was formed when a large glacier dammed several rivers. Groundwater trapped in lake and glacial sediments provides information about the climate at the time the sediments were deposited. Figure 2 shows a cross section of the sediments (lake clay and glacial till) and bedrock in the area. Figure 3 shows the $\delta^{18}O$ values of groundwater taken from samples of the top 40 m of sediment at 3 sites along the same cross section. $\delta^{18}O$ is calculated from a ratio of 2 oxygen isotopes (^{18}O and ^{16}O) in the groundwater. Smaller $\delta^{18}O$ values indicate cooler average temperatures.

Figure 1



Note: $\delta^{18}O = \left[\left(\frac{^{18}O/^{16}O \text{ of groundwater sample}}{^{18}O/^{16}O \text{ of standard water sample}}\right) - 1\right] \times 1{,}000$

Figure 3

Figures adapted from V. H. Remenda, J. A. Cherry, and T. W. D. Edwards, "Isotopic Composition of Old Ground Water from Lake Agassiz: Implications for Late Pleistocene Climate." ©1994 by the American Association for the Advancement of Science.

6. According to Figure 2, the lake clay deposit is thinnest at which of the following cities or sites?

F. Winnipeg
G. Site 1
H. Site 2
J. Grand Forks

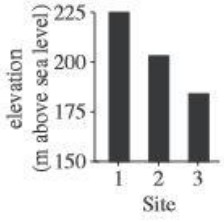
7. According to Figure 3, at Sites 1, 2, and 3, the smallest $\delta^{18}O$ value of the groundwater in the lake clay was recorded at a depth between:

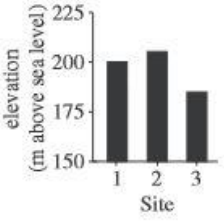
A. 0 m and 10 m.
B. 10 m and 20 m.
C. 20 m and 30 m.
D. 30 m and 40 m.

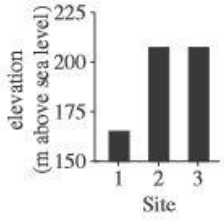
8. According to Figure 2, as the thickness of the lake clay deposit increases from Grand Forks to Site 3, the thickness of the glacial till beneath it:

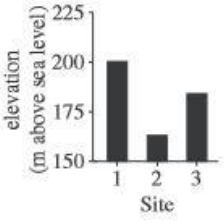
F. increases.
G. remains the same.
H. first increases and then decreases.
J. decreases.

9. According to Figure 2, which of the following graphs best represents the *elevations*, in m above sea level, of the top of the glacial till layer at Sites 1, 2, and 3 ?

A.


C.


B.


D.


10. Precipitation that falls at Sites 1, 2, and 3 soaks into the soil until it reaches the groundwater table about 3 m below the surface. Based on Figure 3, and assuming no alteration of the precipitation, the $\delta^{18}O$ value of present-day precipitation in the study area is closest to:

F. −26.
G. −23.
H. −20.
J. −15.

EXPERIMENTS

Experiment questions are usually a little more involved than charts and graphs questions. They're easy to recognize. They have passages labeled "Experiment One" or "Study Two". Your initial approach is the same as with the charts and graphs questions. Go straight to question one. There are usually a couple of questions at the beginning which only require you to look at one of the figures. But when you get to the more involved questions, you will have to read the experiments. The trick is to read only what you need to answer the question. If the question is about figure one, just look at figure one. Reading through all the experiments and then going to the questions can be ridiculously confusing because you have so much information that you just don't need.

Passage I

Finch beak depth (see Figure 1) is an *inheritable* trait (it can be passed from parents to offspring).

Figure 1

Researchers studied the beak depth of 2 species of finches, *Geospiza fortis* and *Geospiza fuliginosa*. Both species live on Island A. *G. fortis* alone lives on Island B, and *G. fuliginosa* alone lives on Island C. For both species, the primary food is seeds. Birds with shallower beaks can efficiently crush and eat only small seeds. Birds with deeper beaks can crush and eat both large and small seeds, but they prefer small seeds.

Study 1

Researchers captured 100 *G. fortis* finches and 100 *G. fuliginosa* finches on Island A. They tagged each bird, measured its beak depth, and released it. Then they calculated the percent of birds having each of the beak depths that had been measured. The researchers followed the same procedures with 100 *G. fortis* finches from Island B and 100 *G. fuliginosa* finches from Island C. The results of this study are shown in Figure 2.

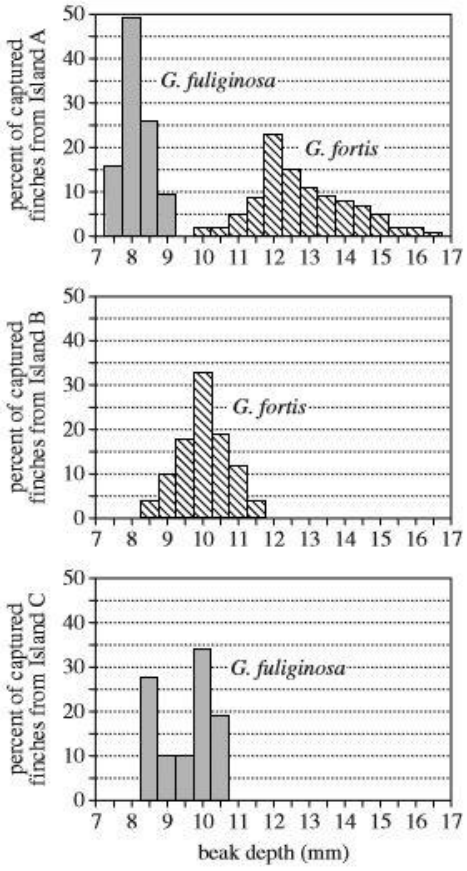


Figure 2

Study 2

After completing Study 1, the researchers returned to Island B each of the next 10 years, from 1976 to 1985. During each visit, the researchers captured at least 50 *G. fortis* finches and measured their beak depths. Then

they calculated the average *G. fortis* beak depth for each of the 10 years. The researchers noted that, during the 10-year period, 3 years were exceptionally dry, and 1 year was very wet (see Figure 3). Small seeds are abundant during wet years. During dry years, all seeds are less abundant, and the average size of the available seeds is larger.

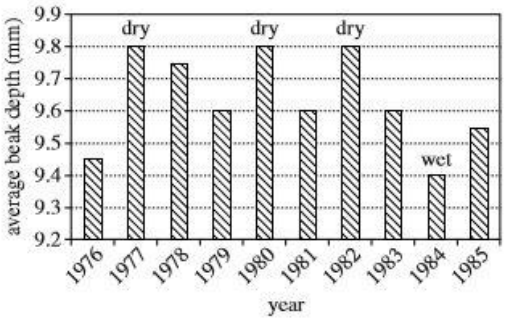


Figure 3

Figures adapted from Neil A. Campbell, Jane B. Reece, and Lawrence G. Mitchell, *Biology*, 5th ed. ©1999 by Benjamin/Cummings.

1. Based on the results of Study 1, the highest percent of finches on Island B and Island C had a beak depth of:

	Island B	Island C
A.	8 mm	8 mm
B.	9 mm	12 mm
C.	10 mm	8 mm
D.	10 mm	10 mm

2. During which of the following years were small seeds likely most abundant on Island B ?

F. 1977
G. 1980
H. 1982
J. 1984

3. Study 1 differed from Study 2 in which of the following ways?

A. *G. fortis* finches were captured during Study 1 but not during Study 2.
B. *G. fuliginosa* finches were captured during Study 1 but not during Study 2.
C. The beak depth of captured birds was measured during Study 1 but not during Study 2.
D. The beak depth of captured birds was measured during Study 2 but not during Study 1.

4. It is most likely that the researchers tagged the birds that they captured during Study 1 to:

F. determine how beak depth was affected by rainfall on Island A.
G. determine the average age of each finch population.
H. ensure that the beak depth of each finch was measured multiple times during Study 1.
J. ensure that the beak depth of each finch was measured only once during Study 1.

5. Based on the results of Study 2, would a finch with a beak depth of 9.4 mm or a finch with a beak depth of 9.9 mm more likely have had a greater chance of survival during 1977 ?

A. A finch with a beak depth of 9.4 mm, because, on average, the size of available seeds is larger during dry years.
B. A finch with a beak depth of 9.4 mm, because, on average, the size of available seeds is smaller during dry years.
C. A finch with a beak depth of 9.9 mm, because, on average, the size of available seeds is larger during dry years.
D. A finch with a beak depth of 9.9 mm, because, on average, the size of available seeds is smaller during dry years.

6. A researcher hypothesized that there would be more variation in the beak depths measured for the *G. fortis* finches when they were forced to compete with another finch species for seeds. Do the results of Study 1 support this hypothesis?

F. Yes; the range of beak depths measured for *G. fortis* finches was greater on Island A than on Island B.
G. Yes; the range of beak depths measured for *G. fortis* finches was greater on Island B than on Island A.
H. No; the range of beak depths measured for *G. fortis* finches was greater on Island A than on Island B.
J. No; the range of beak depths measured for *G. fortis* finches was greater on Island B than on Island A.

CONFLICTING VIEWPOINTS

The conflicting viewpoint passages are also fairly easy to recognize. The passages open with a description of a scientific phenomena followed by a number of explanations for the phenomena. The participants are usually labeled "student one" or "scientist two." Some of the questions will focus on only one of the conflicting viewpoints, and others will ask you to compare or contrast two or more of the hypotheses. Check out the questions first to see which opinion the majority of the questions are about. Read the introductory paragraph and then read that viewpoint first and focus on its hypothesis. Then answer all the questions that focus on only that hypothesis. Next, read the other viewpoint (or viewpoints) and then figure out its hypothesis, and answer all the questions that only focus on that explanation. Finally, attack the remaining questions. Conflicting viewpoint passages are often among the hardest.

An astronomy class is given the following facts about stellar evolution.

1. A star's evolution can be divided into 3 stages: *pre-main sequence* (pre-MS), *main sequence* (MS), and *post-main sequence* (post-MS).

2. Gravity causes part of a cloud of gas and dust to collapse and heat up, creating a pre-MS star. The star's hot dust and gas emit its energy.

3. A pre-MS star becomes an MS star when the star produces the majority of its energy by fusing hydrogen nuclei (protons) at its center to make helium nuclei.

4. An MS star becomes a post-MS star when the star expands in volume and produces the majority of its energy by fusing hydrogen to make helium in a shell surrounding its center.

5. The more massive a star, the more rapidly the star passes through each of the 3 stages of its evolution.

Two students discuss the evolution of the *Algol system*—Algol A, a 3.6-solar-mass MS star; Algol B, a 0.8-solar-mass post-MS star; and Algol C, a 1.7-solar-mass MS star. (One solar mass = the Sun's mass.) The 3 stars orbit a mutual center of mass, with Algol A and Algol B much closer to each other and to the center of mass than to Algol C.

Student 1

The 3 stars of the Algol system formed at the same time from the same cloud of gas and dust. Algol B, originally the most massive of the 3 stars, became a post-MS star and expanded in volume while Algol A remained an MS star. Because the matter in the outer parts of Algol B was more strongly attracted to Algol A than to the matter in the inner parts of Algol B, this matter flowed from Algol B to Algol A, and, over time, Algol A became more massive than Algol B.

Student 2

Algol B was not part of the original Algol system (Algol A and Algol C). Algol B and the original Algol system formed in different clouds of gas and dust at different times and moved in 2 different but intersecting orbits around the center of the galaxy. During a particular orbit, Algol B encountered the original Algol system at the intersection of the 2 orbits and became part of the Algol system.

Algol B became a post-MS star while Algol A and Algol C remained MS stars. Algol B never lost mass to Algol A. Algol B was always less massive than Algol A.

24. Based on Student 2's discussion, Algol B is part of the present Algol system because of which of the following forces exerted on Algol B by the original Algol system?

F. Electric force
G. Magnetic force
H. Gravitational force
J. Nuclear force

25. Based on Student 1's discussion and Fact 4, while matter flowed between Algol A and Algol B, Algol B produced the majority of its energy by fusing:

A. hydrogen nuclei to make helium nuclei at its center.
B. hydrogen nuclei to make helium nuclei in a shell surrounding its center.
C. helium nuclei to make hydrogen nuclei at its center.
D. helium nuclei to make hydrogen nuclei in a shell surrounding its center.

26. Suppose that chemical composition is uniform among stars formed from the same cloud of gas and dust, but that chemical composition varies among stars formed from different clouds of gas and dust. Student 2 would most likely agree with which of the following statements comparing the chemical compositions of the stars in the present-day Algol system at the time they formed?

F. Algol A and Algol B had the most similar compositions.
G. Algol A and Algol C had the most similar compositions.
H. Algol B and Algol C had the most similar compositions.
J. Algol A, Algol B, and Algol C had the same composition.

27. If the mass of the Sun is 2.0×10^{30} kg, what is the mass of Algol C ?

A. 1.6×10^{30} kg
B. 2.0×10^{30} kg
C. 3.4×10^{30} kg
D. 7.2×10^{30} kg

28. Which of the following statements best explains why the reaction described in Fact 3 requires a high temperature and pressure?

F. All protons are positively charged, and like charges attract each other.
G. All protons are positively charged, and like charges repel each other.
H. All electrons are negatively charged, and like charges attract each other.
J. All electrons are negatively charged, and like charges repel each other.