

OCTOBER 2015

Official Student Guide to the PSAT/NMSQT[®]

Preliminary SAT/National Merit Scholarship Qualifying Test

National Merit[®] Scholarship Program
conducted by National Merit Scholarship Corporation
www.nationalmerit.org

Preliminary SAT/National Merit Scholarship Qualifying Test
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test-taking help on the
PSAT/NMSQT[®].

National Merit[®] Scholarship Program

To enter the National Merit Scholarship Program and compete for recognition and 8,600 scholarships to be offered in 2017:

- Take the Preliminary SAT/National Merit Scholarship Qualifying Test (PSAT/NMSQT[®]) in October 2015.

Program entrants must take the test in the specified year of the high school program (see page 6). The 2015 PSAT/NMSQT is the qualifying test for entry to the 2017 program. Most entrants will complete high school and enroll in college in 2017.

- Meet other entry requirements.

Important information about the 2017 National Merit Scholarship Program:

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Scholarship Sponsors

- 10 Corporations and Business Organizations
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Have questions?

Visit NMSC's website: www.nationalmerit.org

**Write: National Merit Scholarship Corporation (NMSC)
1560 Sherman Avenue, Suite 200
Evanston, IL 60201-4897**

Telephone: (847) 866-5100

Steps in the 2017 National Merit® Scholarship Competition

1,500,000 Entrants. In October 2015, U.S. high school students who take the Preliminary SAT/National Merit Scholarship Qualifying Test (PSAT/NMSQT®) and meet other program requirements will enter the 2017 competition for National Merit Scholarship Program recognition and scholarships. Nearly all program participants (entrants) will be juniors planning to enter college in 2017. NMSC uses PSAT/NMSQT Selection Index scores (calculated by doubling the sum of the Reading, Writing and Language, and Math Test scores) to determine 50,000 high-scoring participants who qualify for program recognition.

In April of 2016, NMSC will ask high school principals to identify any errors or changes in the reported eligibility of their high scorers (students whose scores qualify them for recognition).

PARTICIPANTS WHO QUALIFY FOR NATIONAL MERIT PROGRAM RECOGNITION

34,000 Commended Students. In late September 2016, more than two-thirds of the 50,000 high scorers will receive Letters of Commendation in recognition of their outstanding academic promise, but they will not continue in the competition for National Merit Scholarships. However, some of these students may be candidates for Special Scholarships provided by corporate and business sponsors.

16,000 Semifinalists. In early September 2016, nearly a third of the 50,000 high scorers will be notified that they have qualified as Semifinalists. Semifinalists are the highest-scoring entrants in each state. NMSC will notify them through their schools and provide scholarship application materials explaining requirements to advance in the competition for National Merit Scholarships to be offered in 2017.

15,000 Finalists. In February 2017, Semifinalists who meet academic and other requirements will be notified that they have advanced to Finalist standing. All National Merit Scholarship winners (Merit Scholar® awardees) will be chosen from this group of Finalists based on their abilities, skills, and accomplishments.

SCHOLARSHIP WINNERS

1,200 Special Scholarship recipients. Beginning in March 2017, NMSC will notify winners of Special Scholarships provided by corporate sponsors. Recipients are chosen from candidates sent scholarship application materials through their high schools in November 2016. Although not Finalists, scholarship recipients will be outstanding students who meet their sponsors' eligibility criteria. Sponsors will handle public announcement of their Special Scholarship winners.

7,400 Merit Scholarship® winners. Beginning in March 2017, NMSC will notify winners of the three types of National Merit Scholarships:

- » National Merit® \$2500 Scholarships
- » Corporate-sponsored scholarships
- » College-sponsored scholarships

In April, May, June, and July, NMSC will release names of Merit Scholar designees to news media for public announcement.

The 2017 Competition Begins in 2015

The National Merit® Scholarship Program is an annual academic competition among high school students for recognition and college scholarships. The program is conducted by National Merit Scholarship Corporation (NMSC), a not-for-profit organization that operates without government assistance.

The 2015 Preliminary SAT/National Merit Scholarship Qualifying Test (PSAT/NMSQT®) is the qualifying test for entry to the 2017 National Merit Program. (The PSAT™ 10 and PSAT™ 8/9 will NOT be considered for entry to the National Merit Scholarship Program.) The competition will span about 18 months from entry in October 2015 until the spring of 2017 when scholarships for college undergraduate study will be awarded. It is expected that about 3.5 million students will take the PSAT/NMSQT in 2015, and approximately 1.5 million of them will meet requirements to enter this program.

Entry Requirements

To enter the 2017 National Merit Program, a student must meet **all** of the following requirements. He or she must:

1. be enrolled as a high school student (traditional or homeschooled), progressing normally toward graduation or completion of high school by 2017, and planning to enter college no later than the fall of 2017;
2. be a citizen of the United States; or be a U.S. lawful permanent resident (or have applied for permanent residence, the application for which has not been denied) and intend to become a U.S. citizen at the

earliest opportunity allowed by law (see below for documentation required from scholarship candidates who have not yet become U.S. citizens); and

3. take the 2015 PSAT/NMSQT in the specified year of the high school program and no later than the third year in grades 9 through 12, regardless of grade classification or educational pattern (explained in the next section).

A student's responses to *Section 15* items "a" through "d" of the 2015 PSAT/NMSQT Answer Sheet (see below) are used to determine whether he or she meets these requirements.

15a. Are you enrolled as a high school student (traditional or homeschooled)? ☐ Yes ☐ No
15b. When will you complete or leave high school and enroll full time in college? ☐ 2016 ☐ 2018 ☐ Not planning to attend college ☐ 2017 ☐ after 2018
15c. How many years will you spend in grades 9 through 12? ☐ 4 years ☐ 1 year ☐ 3 years ☐ 5 or more years ☐ 2 years
15d. Are you a citizen of the United States? ☐ Yes ☐ No ☐ No, but I am a U.S. lawful permanent resident (or have applied for permanent residence, the application for which has not been denied) and I intend to become a U.S. citizen at the earliest opportunity allowed by law.

The NMSC section of the PSAT/NMSQT Score Report shows the student's responses to these questions and whether entry requirements have been met for the National Merit Scholarship Program.

Not yet a U.S. citizen?

If you qualify to continue in the 2017 competition (as a Semifinalist or Special Scholarship candidate) **and** you have not yet become a U.S. citizen, you will be required to send the following documentation to NMSC with your Scholarship Application:

- A letter signed by you explaining your plans for becoming a citizen, including the date on which you expect to be eligible and will apply for U.S. citizenship

AND

- **If you are a U.S. lawful permanent resident**, a copy of your Permanent Resident Card (Green Card); or a copy of your passport including the identity/biographical page and the "I-551" stamp showing that you have been granted lawful permanent resident status

OR

- **If you have applied for U.S. lawful permanent residence**, a copy of Form I-797 Receipt Notice from U.S. Citizenship and Immigration Services (CIS) that verifies you filed the "Application to Register Permanent Residence or Adjust Status" (Form I-485). **Note:** Form I-797 Receipt Notice must be received by NMSC on or before January 31, 2017.

When to Take the Test

To participate in the National Merit Program, students must take the PSAT/NMSQT in the specified year of their high school program. Because a student can participate (and be considered for a scholarship) in only one specific competition year, the year in which the student takes the PSAT/NMSQT to enter the competition is very important.

1. **Students who plan to spend the usual four years in high school (grades 9 through 12) before entering college full time** must take the qualifying test in their third year of high school (grade 11, junior year).

Sophomores who take the 2015 PSAT/NMSQT but plan to spend four years in grades 9 through 12 will **not** meet entry requirements for the 2017 National Merit Program. They must take the PSAT/NMSQT again in 2016 (when they are juniors) to enter the competition that will end when scholarships are awarded in 2018, the year they will complete high school and enter college.

2. **Students who plan to leave high school early to enroll in college full time after spending three years or less in grades 9 through 12** usually can participate in the National Merit Program if they take the PSAT/NMSQT before they enroll in college. To enter the 2017 competition, these students must be in either the *next-to-last* or the *last year* of high school when they take the 2015 PSAT/NMSQT:

- a. if they are in the *next-to-last year* of high school when they take the 2015 PSAT/NMSQT, they will be finishing their last high school year when awards are offered in 2017; or
- b. if they are in their *last year* of high school when they take the 2015 PSAT/NMSQT, they will be completing their first year of college when scholarships are awarded in 2017.

3. **Students who plan to participate in a post-secondary enrollment options program** (through which they enroll simultaneously in *both* high school and college) must take the qualifying test in their third year of high school (grade 11, junior year). To enter the competition that ends when scholarships are offered in 2017, these students must be in their third year of high school when they take the 2015 PSAT/NMSQT, the same as all other students who plan to spend four years in grades 9 through 12. The high school determines whether a student is participating in a post-secondary enrollment options program and certifies the student's status.

4. **Students who plan to take five years to complete grades 9 through 12** can participate in the National Merit Program if they take the PSAT/NMSQT in the third year of high school and again in the fourth year. These students' scores will not be eligible for the program until a written request for entry to the competition is approved by NMSC. The request should include the student's name, high school name and location, year the student began high school, year the student will complete high school, and a brief explanation of the student's educational pattern.

NMSC will use the student's score from the PSAT/NMSQT taken in the student's third year of grades 9 through 12 to determine the expected level of recognition. In order to be recognized in the fifth (final) year of high school, the student must take the PSAT/NMSQT again in the fourth year, and earn a qualifying score at or above the level achieved on the third year test. The level of recognition a student receives cannot exceed the level earned on the qualifying test taken during the student's third year in grades 9 through 12, the year in which all other competitors are considered.

NOTE: If your high school standing and enrollment do not fit one of the preceding descriptions (1, 2, 3, or 4) or if you have any questions about when to take the PSAT/NMSQT for National Merit Program entry, contact NMSC immediately.

Unable to Take the PSAT/NMSQT?

If you do not take the 2015 PSAT/NMSQT because of illness, an emergency, or other extenuating circumstance, you may still be able to enter the 2017 National Merit Scholarship Program. To request information about another route of entry after the October 2015 PSAT/NMSQT administration, **write** to NMSC as soon as possible but no later than March 1, 2016. Please include your home mailing address. **Do not delay**; the earlier you write, the more options you will have for scheduling test dates.

Fax your request to:

(847) 866-5113

Attn: Scholarship Administration

Or you may mail your request to:

National Merit Scholarship Corporation

Attn: Scholarship Administration

1560 Sherman Avenue, Suite 200

Evanston, IL 60201-4897

Your fax must be received or your letter postmarked on or before March 1, 2016, for your request to be considered.

If you do not want your 2015 PSAT/NMSQT scores used for participation in the 2017 National Merit Program due to an irregularity that occurred when you took the test, you must contact NMSC immediately but no later than November 15, 2015, to submit a formal request. Requests received after November 15, 2015, will not be considered.

Program Recognition

NMSC uses PSAT/NMSQT Selection Index scores (calculated by doubling the sum of the Reading, Writing and Language, and Math Test scores) as an initial screen of some 1.5 million program entrants. The 2015 test scores of all students who meet entry requirements for the 2017 program will be considered. In the spring of 2016, NMSC will ask high school principals to identify any errors or changes in the reported eligibility of their high scorers (students whose scores qualify them for recognition).

Commended Students. In September 2016, more than two-thirds (about 34,000) of the high scorers will be designated Commended Students. They will

be named on the basis of a nationally applied Selection Index qualifying score that may vary from year to year.

In recognition of their outstanding ability and potential for academic success in college, these students will be honored with Letters of Commendation sent to them through their high schools. Although Commended Students will not continue in the competition for National Merit Scholarships, some may be candidates for Special Scholarships offered by corporate sponsors (see page 9). NMSC will notify those candidates in November 2016.

Semifinalists. Some 16,000 of the high scorers, representing less than 1 percent of the nation's high school graduating seniors, will qualify as Semifinalists. Only Semifinalists will have an opportunity to advance in the competition for Merit Scholarship® awards. NMSC will notify Semifinalists of their standing and send scholarship application materials to them through their high schools in September 2016. Their names will be sent to regionally accredited four-year U.S. colleges and universities and released to local news media for public announcement in mid-September.

NMSC designates Semifinalists in the program on a state-representational basis to ensure that academically able young people from all parts of the United States are included in this talent pool. Using the latest data available, an allocation of Semifinalists is determined for each state, based on the state's percentage of the national total of high school graduating seniors. For example, the number of Semifinalists in a state that enrolls approximately two percent of the nation's graduating seniors would be about 320 (2 percent of the 16,000 Semifinalists).

NMSC then arranges the Selection Index scores of all National Merit Program participants within a state in descending order. The score at which a state's allocation is most closely filled becomes the Semifinalist qualifying score. Entrants with a Selection Index at or above the qualifying score are named Semifinalists. As a result of this process, Semifinalist qualifying scores vary from state to state and from year to year, but the scores of all Semifinalists are extremely high.

In addition to Semifinalists designated in each of the 50 states and without affecting the allocation to any state, Semifinalists are named in several other selection units that NMSC establishes for the competition. These units are for students attending schools in the District of Columbia, schools in

U.S. commonwealths and territories, schools in other countries that enroll U.S. citizens, and U.S. boarding schools that enroll a sizable proportion of their students from outside the state in which the school is located. A participant can be considered for Semifinalist standing in only one state or selection unit, based on the high school in which the student is regularly enrolled when taking the PSAT/NMSQT.

Finalists. A Semifinalist must fulfill several additional requirements and advance to the Finalist level of the competition before being considered for a National Merit Scholarship. Approximately 90 percent (about 15,000) of the Semifinalists are expected to become Finalists and receive a Certificate of Merit attesting to their distinguished performance in the competition.

To qualify as a Finalist, a Semifinalist must:

1. continue to meet all program entry requirements (explained on page 5);
2. be enrolled in the last year of high school and planning to enroll full time in college the following fall, or be enrolled in the first year of college if grades 9 through 12 were completed in three years or less;
3. complete the National Merit Scholarship Application with all information requested, which includes writing an essay;
4. have a record of very high academic performance in all of grades 9 through 12 and in any college course work taken (the high school must provide a complete record of courses taken and grades earned by the student, as well as information about the school's curriculum and grading system);
5. be fully endorsed for Finalist standing and recommended for a National Merit Scholarship by the high school principal;
6. take the SAT® and earn scores that confirm the PSAT/NMSQT performance that resulted in Semifinalist standing; and
7. provide any other documentation and information that NMSC requests.

Choosing Scholarship Winners

Only Finalists will be considered for the 7,400 National Merit Scholarships. Approximately half of the Finalists will be Merit Scholarship winners (Merit Scholar® awardees). Winners are chosen on the basis of their abilities, skills, and accomplishments—

without regard to gender, race, ethnic origin, or religious preference. Scholarship recipients are the candidates judged to have the greatest potential for success in rigorous college studies and beyond.

To receive a scholarship payment, a Merit Scholarship winner must notify NMSC of plans to (a) enroll in a college or university in the United States that holds accredited status with a regional accrediting commission on higher education, and (b) enroll full time in an undergraduate course of study leading to a traditional baccalaureate degree. NMSC scholarship stipends are not payable for attendance at service academies, virtual universities, and certain institutions that are limited in their purposes or training.

The selection process involves evaluating substantial amounts of information about Finalists obtained from both students and their high schools. Included are the Finalist's academic record (course load and difficulty level, depth and breadth of subjects studied, and grades earned); standardized test scores; the student's essay; demonstrated leadership and contributions to school and community activities; and the school official's written recommendation and characterization of the Finalist.

The same process is used to select Special Scholarship winners for a corporate sponsor's awards.

Types of Scholarships

Some 7,400 National Merit Scholarships of three types and approximately 1,200 Special Scholarships will be awarded in 2017; these 8,600 awards will have a combined value of more than \$43 million. Different types of scholarships will be offered, but no student can receive more than one monetary award from NMSC.

National Merit® \$2500 Scholarships. These awards are unique because every Finalist is considered for one and winners are named in *every* state and other selection unit. The number awarded in each state is determined by the same representational procedure used to designate Semifinalists. Finalists compete with all other Finalists in their state or selection unit for one of the 2,500 National Merit \$2500 Scholarships. Winners are selected by a committee of college admission officers and high school counselors.

National Merit \$2500 Scholarships provide a single payment of \$2,500. NMSC's own funds support the majority of these scholarships, but corporate sponsors help underwrite these awards with grants they provide to NMSC in lieu of paying administrative fees.

A Total of 8,600 Scholarships Offered

	National Merit® \$2500 Scholarships	Corporate-sponsored Merit Scholarships	Corporate-sponsored Special Scholarships	College-sponsored Merit Scholarships
Who is considered?	All Finalists compete with all other Finalists in their state or other selection unit.	Finalists who meet criteria specified by a corporate sponsor, usually: • children of employees; • residents of specific communities; or • Finalists with certain college major or career plans	High-performing program participants (although not Finalists) who meet a sponsor's criteria; most are for: • children of employees; • residents of specific communities; or • participants with certain college major or career plans	Finalists who plan to attend a sponsor college and have informed NMSC that the sponsor college is their first choice
Who selects winners?	A committee of college admission officers and high school counselors	NMSC's professional staff	NMSC's professional staff	Officials of each sponsor college
What is the monetary value?	Awards provide a one-time payment of \$2,500.	Varies by sponsor—awards can be one-time or renewable. (See chart on page 10.)	Varies by sponsor—awards can be one-time or renewable. (See chart on page 10.)	Awards are renewable for 4 years of study at the sponsor institution. Stipends range from \$500 to \$2,000 per year.
When does NMSC begin sending scholarship offers?	Late March	Early March	Early March	Early May

Corporate-sponsored scholarships. In 2015, about 250 corporations, company foundations, and businesses sponsored scholarships through the National Merit Program as part of their educational philanthropy. These sponsors committed \$18 million to support more than 1,000 corporate-sponsored Merit Scholarship awards and 1,200 Special Scholarships for students with qualifications that particularly interest them.

The number of **National Merit** Scholarships a company or business offers annually may range from one to more than 100. Finalists who meet a sponsor's criteria are identified from information Semifinalists supply on their scholarship applications. Winners are selected from this pool based on their abilities, skills, and accomplishments. The scholarship name usually identifies the grantor—for example, National Merit XYZ Company Scholarship.

Over two-thirds of the program's corporate sponsors also provide **Special** Scholarships. Organizations that sponsor Special Scholarships make Entry Forms available to children of employees or

members, or to students with other qualifications that interest them. Entry Forms are completed by students (and their parents, if applicable). If the number of Finalists eligible for a sponsor's awards is smaller than the number of awards the corporate organization wishes to offer, NMSC establishes a pool of high-scoring candidates who filed Entry Forms. NMSC then sends Special Scholarship application materials to these candidates through their high schools and invites them to compete for the sponsor's Special Scholarships.

Each corporate sponsor specifies the monetary limits of scholarships it finances and decides whether the awards provide one-time payments or stipends that can be renewed for up to four years of college undergraduate study. Although financial need is not considered in the selection of winners, some corporate-sponsored renewable scholarships provide variable stipends that are individually determined, taking into account college costs and family financial circumstances. See the chart at the top of the next page.

Type of Award	Type of Stipend	Stipend Ranges
Renewable	Variable	\$500–\$10,000 per year
Renewable	Fixed	\$1,000–\$5,000 per year
One-time	Single-payment	\$2,500–\$5,000

College-sponsored Merit Scholarships. In the 2017 competition, it is expected that about 3,900 National Merit Scholarships will be offered to Finalists who plan to attend a sponsor college or university. (See the list of about 190 colleges that currently are Merit Scholarship sponsors beginning on page 20.) A college-sponsored scholarship is renewable for up to four years of undergraduate study at the sponsor institution. It cannot be transferred; therefore, it is canceled if a winner does not attend the college financing the award.

Officials of each sponsor institution choose award recipients from among Finalists who have been accepted for admission and have informed NMSC that the sponsor college or university is their first choice. College officials also determine each winner's stipend within a range of \$500 to \$2,000 per year. The college may meet some of a winner's financial need with an aid package that includes loans, employment, and grants; however, the Merit Scholarship stipend must represent at least half the winner's need, up to the annual stipend maximum of \$2,000, unless the student's total need (as calculated by the college) is met with gift aid.

Scholarship Sponsors

Approximately 440 independent organizations and institutions sponsor more than two-thirds of the National Merit Scholarships offered each year. All Special Scholarships are sponsored by business organizations that also support Merit Scholarship awards.

Corporate scholarship sponsors. Following is a list of corporate organizations that currently sponsor scholarships in the National Merit Program with any eligibility criteria that apply to candidates for their awards. An asterisk (*) indicates the sponsor offers Special Scholarships in addition to National Merit Scholarships and requires that Entry Forms be filed.

The number of awards shown is an estimate of the yearly total, and neither the sponsor nor NMSC is obligated to offer these scholarships in 2016, 2017, or beyond.

AbbVie Inc.—Every Finalist who is the child of an employee of the corporation or a U.S. subsidiary will be offered an award.

* **Acushnet Company**—3 awards for children of employees of the company and its subsidiaries.

* **ADP Foundation**—40 awards for children of employees of Automatic Data Processing, Inc.

Advocate Medical Group—2 awards for Finalists from the Chicago area planning careers as physicians.

* **Aerojet Rocketdyne Foundation**—10 awards for the children of employees of Aerojet Rocketdyne Holdings, Inc. and its subsidiaries.

Air Products and Chemicals, Inc.—Every Finalist who is the child of an employee of the corporation or a subsidiary will be offered an award.

* **Akzo Nobel Inc.**—6 awards for children of employees of the corporation and its subsidiaries.

* **Albany International**—2 awards for children of employees of the corporation and its subsidiaries.

* **The Allergan Foundation**—6 awards for children of employees of Allergan, Inc. and its eligible subsidiaries.

Alliance Data Systems Corporation—Every Finalist who is the child of an employee of the corporation or an eligible subsidiary will be offered an award.

* **Ameren Corporation Charitable Trust**—6 awards for children of employees of Ameren Corporation.

* **American City Business Journals, Inc.**—2 awards for children of employees of the corporation.

American Electric Power Company, Inc.—5 awards for Finalists who are children of employees of the corporation and its subsidiaries.

* *This corporate sponsor offers Special Scholarships in addition to Merit Scholarship® awards, and Entry Forms that the sponsor makes available must be filed.*

* **American Financial Group**—2 awards for children of employees of the corporation and its subsidiaries.

* **AmerisourceBergen Corporation**—8 awards for children of employees of the corporation and its subsidiaries.

* **The AMETEK Foundation**—7 awards for children of employees of AMETEK, Inc. and its subsidiaries.

* **Anadarko Petroleum Corporation**—4 awards for children of employees of the corporation and its subsidiaries.

* **Aon Foundation**—12 awards for children of employees of Aon and its subsidiaries.

Apache Corporation—2 awards for Finalists who are children of employees of the corporation and its subsidiaries.

* **Archer Daniels Midland Company**—10 awards for children of employees of ADM and its subsidiaries.

* **Arkema Inc. Foundation**—4 awards for children of employees of Arkema Inc. and its subsidiaries.

* **Armstrong Foundation**—10 awards for children of employees of Armstrong World Industries, Inc. and its subsidiaries.

ASC Partners, LLC—2 awards for Finalists in the National Merit Scholarship Program.

ASM Materials Education Foundation—1 award for a Finalist who plans a career in the field of materials engineering.

* **Astellas US LLC**—2 awards for children of employees of the corporation.

* **AstraZeneca Pharmaceuticals LP**—20 awards for children of employees of the corporation.

Baker Hughes Foundation—5 awards for Finalists who are children of employees of Baker Hughes Incorporated and its eligible subsidiaries.

BASF Corporation—Up to 20 awards for Finalists who are children of employees of the corporation and its subsidiaries.

Battelle—Every Finalist who is the child of an employee of the company will be offered an award.

* **Bayer USA Foundation**—25 awards for children of employees of Bayer.

Bentley Systems, Incorporated—For all Finalists who are children of colleagues of the corporation.

Mary E. Beyerle Trust—8 awards for Finalists from Maryland, New Jersey, and Pennsylvania.

Black & Veatch Corporation—2 awards for Finalists who are children of employees of the corporation and its subsidiaries.

BNSF Railway Foundation—Up to 10 awards for Finalists who are children of employees of BNSF Corporation and its subsidiaries.

The Boeing Company—Every Finalist who is the child of an employee of the company or a subsidiary will be offered an award.

* **BorgWarner Inc.**—6 awards for children of employees of the corporation and its subsidiaries and divisions.

* **BP Corporation North America, Inc.**—45 awards for children of employees and annuitants of BP, plc and its wholly owned subsidiaries.

* **Branch Banking & Trust Company**—10 awards for children of employees of BB&T.

* **Bridgestone Americas Trust Fund**—Up to 50 awards for children of employees of Bridgestone Americas, Inc. and its participating subsidiaries.

* **Bristol-Myers Squibb Foundation, Inc.**—50 awards for children of employees of the Bristol-Myers Squibb Company's U.S. divisions and subsidiaries.

* **Broadridge Financial Solutions, Inc.**—4 awards for children of employees of the corporation and its qualifying subsidiaries.

* *This corporate sponsor offers Special Scholarships in addition to Merit Scholarship® awards, and Entry Forms that the sponsor makes available must be filed.*

Corporate scholarship sponsors (continued)

- * **Brocade Communications Systems, Inc.**—3 awards for children of employees of the corporation.
- * **Brooks Brothers Group, Inc.**—2 awards for children of employees of the corporation and its subsidiaries.
- * **Bunge North America, Inc.**—4 awards for children of employees of the corporation and its subsidiaries; the awards are distributed among employment groups.
- * **Bunzl USA, Inc.**—5 awards for children of employees of the corporation and its subsidiaries.

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- * **CACI International Inc.**—5 awards—3 awards for children of employees of the company and its subsidiaries; 2 awards for Finalists who are planning to major in certain technological and mathematical fields.

California Resources Corporation—Every Finalist who is the child of an employee of the corporation will be offered an award.

Cardinal Health Foundation—Every Finalist who is the child of an employee of Cardinal Health, Inc. or a participating affiliate will be offered an award.

- * **Carlisle Companies Incorporated**—2 awards for children of employees of the corporation and its subsidiaries.
- * **Carpenter Technology Corporation**—3 awards for children of employees of the corporation and its subsidiaries.

CBS Corporation—5 awards for Finalists who are children of employees of the corporation and its eligible subsidiaries.

- * **CDK Global, LLC**—6 awards for children of employees of the corporation.
- * **Chemtura Corporation**—4 awards for children of employees of the corporation and its subsidiaries.
- Chevron U.S.A. Inc.**—10 awards for Finalists who are children of employees of the corporation and its affiliated companies.

- * **Chico's FAS, Inc.**—3 awards for children of employees of the corporation and its subsidiaries.

Citizen Watch Company of America, Inc.—25 awards—1 award for a Finalist from each of 25 designated states.

- * **Colgate-Palmolive Company**—20 awards for children of employees of the company and its subsidiaries.
- * **Computer Aid, Inc.**—2 awards for children of employees of the corporation and its subsidiaries.

Computer Sciences Corporation—5 awards for Finalists who are children of employees of the corporation and its subsidiaries.

ConAgra Foods Foundation—Up to 10 awards for Finalists who are children of employees of ConAgra Foods, Inc. and its subsidiaries.

- * **CONSOL Energy Inc.**—5 awards for children of employees of the corporation and its designated subsidiaries.
- * **Corning Incorporated**—5 awards for children of employees of the corporation and its subsidiaries.
- * **(COUNTRY Financial) CC Services, Inc.**—5 awards for children of COUNTRY employees.
- * **Covidien**—12 awards for children of employees of Covidien and its subsidiaries.
- CSX Corporation**—10 awards—5 awards for Finalists who are children of employees of the corporation; 5 awards for Finalists from the Jacksonville, Florida area who plan to pursue certain college majors.
- * **Cytex Industries Inc.**—4 awards for children of employees of the corporation and its subsidiaries.

The Delphi Foundation—4 awards for Finalists who are children of employees of Delphi Automotive System LLC and its subsidiaries.

- * *This corporate sponsor offers Special Scholarships in addition to Merit Scholarship® awards, and Entry Forms that the sponsor makes available must be filed.*

* **DENTSPLY International Inc.**—2 awards for children of U.S. associates of the corporation and its subsidiaries.

* **R. R. Donnelley Foundation**—25 awards for children of employees of the company and its subsidiaries.

The Dow Chemical Company Foundation—10 awards for Finalists who are children of employees of the company and its subsidiaries.

* **Dow Jones & Company, Inc.**—15 awards for the children of employees of the company and its wholly owned subsidiaries.

E*TRADE Financial Corporation—2 awards for Finalists who are children of employees of the corporation.

Eastman Chemical Company Foundation, Inc.—8 awards for Finalists who are children of employees of Eastman Chemical Company and its subsidiaries.

* **Eaton Charitable Fund**—15 awards for children of employees of Eaton Corporation.

* **Electrolux North America**—4 awards—2 awards for children of salaried employees of the corporation and its subsidiaries; 2 awards for children of hourly employees.

Emerson Charitable Trust—10 awards for Finalists who are children of employees of Emerson Electric Co. and its subsidiaries.

* **Essentra Holdings Corporation**—2 awards for children of employees of the corporation and its subsidiaries.

* **Estee Lauder Companies Inc.**—3 awards for children of employees of the corporation and its U.S. affiliates and subsidiaries.

* **Ethicon, Inc.**—2 awards for children of employees of the corporation.

* **Eversource Energy**—5 awards for children of employees of the company or its subsidiaries.

* **FedEx Custom Critical, Inc.**—4 awards—2 awards for children of employees; 2 awards for children and grandchildren of contractors.

* **FedEx Freight Corporation**—20 awards for children of employees of the corporation.

* **FedEx Ground Package System, Inc.**—12 awards—6 awards for the children of package handlers; 6 awards for the children of non-package handlers.

* **Ferro Corporation**—3 awards for children of employees of the corporation.

* **Fifth Third Foundation**—25 awards for children of employees of Fifth Third Bank.

Fluor Foundation—4 awards for Finalists who are children of employees of Fluor.

* **FMC Corporation**—3 awards for children of employees of the corporation and its subsidiaries.

* **FMC Technologies, Inc.**—2 awards for children of employees of the corporation and its affiliated businesses.

Formosa Plastics Corporation, U.S.A.—Every Finalist who is the child of an employee of the corporation or an affiliated organization will be offered an award.

FORUM Pharmaceuticals Inc.—2 awards for Finalists with preference (1st) for the children of employees of the corporation and its eligible subsidiaries; (2nd) for those planning a major and career in biological and biomedical sciences.

FTS International, LLC—1 award for a Finalist from either Washington, DC, or Denver, Colorado, metropolitan areas planning to pursue certain college majors.

* *This corporate sponsor offers Special Scholarships in addition to Merit Scholarship® awards, and Entry Forms that the sponsor makes available must be filed.*

* **GAF**—2 awards for children of employees of the corporation and its subsidiaries; the awards are distributed among divisions.

* **Gannett Foundation, Inc.**—12 awards for children of employees of Gannett Co. Inc.

GEICO Philanthropic Foundation—3 awards for Finalists who are children of associates of GEICO Corporation and its subsidiaries.

General Dynamics—Every Finalist who is the child of an employee of the corporation or a subsidiary will be offered an award.

* **General Dynamics Ordnance and Tactical Systems**—2 awards for children of employees of the corporation and its subsidiaries.

General Mills Foundation—Up to 10 awards for Finalists who are children of employees of General Mills, Inc. and its subsidiaries.

* **Georgia-Pacific Foundation, Inc.**—50 awards for children of employees of Georgia-Pacific LLC and its subsidiaries within the United States; the awards are distributed among divisions.

* **GKN Foundation**—5 awards for children of employees of GKN America Corp. and its subsidiaries.

* **Gleason Family Foundation**—Up to 8 awards for children of employees of Gleason Corporation and its U.S. subsidiaries and divisions.

* **Global Tungsten & Powders Corp.**—2 awards for children of employees of the corporation.

* **W.W. Grainger, Inc.**—10 awards for children of employees of the corporation and its U.S. subsidiaries.

* **Greyhound Lines, Inc.**—Up to 6 awards for children of employees of the corporation and its subsidiaries.

* **(Gulfstream Aerospace Corporation) Rolls-Royce North America Inc.**—2 awards for children of employees of Gulfstream Aerospace Corporation.

Harris Corporation—2 awards for Finalists who are children of employees of the corporation and its divisions.

* **Harsco Corporation Fund**—Up to 12 awards for children of employees of the corporation and its subsidiaries.

* **H. J. Heinz Company Foundation**—Up to 6 awards for children of employees of the company and its affiliates.

* **Henkel Corporation**—6 awards for children of employees of the corporation and its subsidiaries.

* **(Hoffmann-La Roche Inc.) Genentech, Inc.**—20 awards for children of employees of Hoffmann-La Roche Inc. and its designated subsidiaries.

* **Hormel Foods Corporation Charitable Trust**—18 awards for children of employees of Hormel Foods Corporation and its subsidiaries.

* **Houghton Mifflin Harcourt**—2 awards for children of employees of the company and its subsidiaries.

* **The Harvey Hubbell Foundation**—4 awards for children of employees of Hubbell Incorporated and its subsidiaries.

* **Illinois Tool Works Foundation**—Up to 30 awards for children of employees of Illinois Tool Works Inc. and its subsidiaries.

* **Ingalls Shipbuilding Division of Huntington Ingalls Industries**—4 awards for the children of employees of Ingalls Shipbuilding.

* **Ingersoll-Rand Charitable Foundation**—17 awards for children of employees of Ingersoll Rand Company and its subsidiaries.

* **Inspireity Services, L.P.**—4 awards—2 awards for children of corporate employees; 2 awards for children of worksite employees.

* *This corporate sponsor offers Special Scholarships in addition to Merit Scholarship® awards, and Entry Forms that the sponsor makes available must be filed.*

- * **International Union of Bricklayers and Allied Craftworkers**—3 awards for children of members of the union in good standing.

Jacobs Engineering Foundation—Every Finalist who is the dependent of an employee of Jacobs Engineering Group, Inc. or a subsidiary will be offered an award.

- * **Janssen Pharmaceuticals, Inc.**—5 awards for the children of employees of the corporation.
- * **Janssen Research & Development, LLC**—3 awards for children of employees of the corporation.
- * **Janssen Supply Chain**—4 awards for children of employees of the organization.
- * **John Bean Technologies Corporation**—2 awards for children of employees of JBT Corporation and its subsidiaries.
- * **Johnson & Johnson World Headquarters**—2 awards for children of employees of Johnson & Johnson World Headquarters.

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- * **Kaman Corporation**—3 awards for children of employees of the corporation and its subsidiaries.

- * **The Kennametal Foundation**—5 awards for children of employees of Kennametal Inc. and its subsidiaries.

Knovel—2 awards for Finalists from specified geographical areas who plan to pursue a major in mechanical, plastics, design, or civil engineering.

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- * **LANXESS Corporation**—2 awards for children of employees of the corporation and its subsidiaries.

Leidos, Inc.—10 awards for Finalists who are children of employees of the corporation or its subsidiaries.

- * **Liberty Mutual Scholarship Foundation**—30 awards for children of employees of Liberty Mutual Insurance Company and its subsidiaries.

- * **Lockheed Martin Corporation**—100 awards for children of employees of the corporation and its subsidiaries.

- * **Loews Foundation**—4 awards for children of employees of Loews Corporation and its divisions and wholly owned subsidiaries.

- * **Lord & Taylor Foundation**—2 awards for student associates and children of associates of Lord & Taylor LLC.

- * **LPL Financial**—9 awards—6 awards for children of associates of the corporation; 3 awards for students served through non-profit organizations designated by the corporation.

The Lubrizol Foundation—Every Finalist who is the child of an employee of The Lubrizol Corporation, a U.S. subsidiary, or Lubrizol Specialty Products, Inc., will be offered an award.

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- * **Macy's, Inc.**—54 awards for student employees and children of employees of Macy's, Inc. and its direct and indirect subsidiaries; the awards are distributed among divisions.

- * **Mannington Mills, Inc.**—2 awards for children of employees of the corporation.

- * **Maritz Holdings Inc.**—3 awards for children of employees of the corporation and its subsidiaries.

- * **Marsh & McLennan Companies, Inc.**—20 awards for children of employees of the corporation and its subsidiaries.

- * **McGraw Hill Financial, Inc.**—6 awards for the children of employees of the corporation or its subsidiaries.

- * *This corporate sponsor offers Special Scholarships in addition to Merit Scholarship® awards, and Entry Forms that the sponsor makes available must be filed.*

Corporate scholarship sponsors (continued)

* **McKesson Foundation Inc.**—20 awards for children of employees of McKesson and its divisions and subsidiaries.

* **Mead Johnson & Company, LLC**—2 awards for children of employees of the company.

Mead Witter Foundation, Inc.—10 awards for Finalists from specified geographic areas of Wisconsin.

Glenn and Ruth Mengle Foundation—Up to 4 awards for Finalists from three Pennsylvania counties—Clearfield, Elk, and Jefferson.

MetLife Foundation—Every Finalist who is the child of an employee of MetLife will be offered an award.

The MITRE Corporation—2 awards for Finalists who are children of employees of the corporation.

* **The Moody's Foundation**—2 awards for children of employees of Moody's Corporation and its subsidiaries.

Motorola Solutions Foundation—Every Finalist who is the child of an employee of Motorola Solutions, Inc. or a subsidiary will be offered an award.

National Distillers Distributors Foundation—7 awards for Finalists in the National Merit Scholarship Program.

* **(National Gypsum Company) C. D. Spangler Foundation, Inc.**—2 awards for children of employees of National Gypsum Company and its subsidiaries.

* **Nationwide Foundation**—10 awards—6 awards for children of employees of Nationwide Insurance Companies and certain affiliates and associates; 4 awards for children of career agents.

* **New Jersey Manufacturers Insurance Company**—At least 3 awards for children of employees of New Jersey Manufacturers Insurance Group.

New York Life Foundation—Every Finalist who is the child of an employee or agent of New York Life or certain subsidiaries will be offered an award.

* **The NewMarket Foundation**—2 awards for children of employees of NewMarket Corporation and its subsidiaries.

* **NextEra Energy Foundation, Inc.**—10 awards for children of employees of NextEra Energy, Inc. and its subsidiaries.

* **NiSource Charitable Foundation**—20 awards for children of employees of NiSource and its subsidiaries.

* **Norfolk Southern Foundation**—10 awards for children of employees of Norfolk Southern Corporation and its affiliated companies.

* **Northrop Grumman Corporation**—50 awards for children of employees of the corporation and its subsidiaries.

* **Novartis US Foundation**—20 awards for children of employees of Novartis Corporation and its subsidiaries.

* **Novo Nordisk Inc.**—2 awards for children of employees of the corporation.

Occidental Petroleum Corporation—Every Finalist who is the child of an employee of the corporation or a division or subsidiary will be offered an award.

O'Donnell Foundation—2 awards for Finalists from specified high schools located in Texas.

* **Old National Bancorp**—3 awards for children of associates of the corporation and its entities.

Olin Corporation Charitable Trust—Every Finalist who is the child of an employee of Olin Corporation or a subsidiary will be offered an award.

* **OMNOVA Solutions Foundation, Inc.**—3 awards for children of employees of OMNOVA Solutions, Inc. and its subsidiaries.

* *This corporate sponsor offers Special Scholarships in addition to Merit Scholarship® awards, and Entry Forms that the sponsor makes available must be filed.*

Omron Foundation, Inc.—5 awards for Finalists with preference (1st) for those who are children of employees of Omron; (2nd) for those from Illinois or Michigan intending to major in electrical engineering, science, or mathematics.

Owens Corning Foundation—Every Finalist who is the child of an employee of Owens Corning will be offered an award.

Panavision Inc.—2 awards for Finalists who are children of employees of the corporation.

Parker Hannifin Foundation—Every Finalist who is the child of an employee of Parker Hannifin Corporation or a subsidiary will be offered an award.

Sagar G. Patel Memorial Fund—2 awards for Finalists who are the children of employees of Accenture LLP.

* **Payless ShoeSource, Inc.**—5 awards for children of employees of the corporation.

* **Frank E. Payne and Seba B. Payne Foundation**—3 awards for children or grandchildren of employees of John Crane Inc. and its domestic subsidiaries.

* **The Penn Mutual Life Insurance Company**—2 awards for children of company employees, agents, and office employees.

The PepsiCo Foundation, Inc.—Every Finalist who is the child of an employee of PepsiCo, Inc. or a division or subsidiary will be offered an award.

* **Pfizer Inc.**—50 awards for children of employees of the corporation and its subsidiaries.

* **Pilkington North America, Inc.**—2 awards for children of employees of the corporation and its subsidiaries.

* **PPG Industries Foundation**—51 awards—35 awards for children of employees of PPG Industries, Inc. and its subsidiaries; 16 awards for residents of communities where PPG has operations.

* **PPG Industries, Inc.**—2 awards for children of employees of Platinum Distributors of PPG Industries, Inc.

* **PPL**—4 awards for children of employees of the corporation.

PricewaterhouseCoopers Charitable Foundation, Inc.—15 awards for Finalists who are children of partners, principals and staff of PricewaterhouseCoopers LLP.

Principal Life Insurance Company—Every Finalist who is the child of an employee of the company or a subsidiary will be offered an award.

Public Service Enterprise Group—Every Finalist who is the child of an employee of Public Service Enterprise Group or its subsidiaries will be offered an award.

* **Putnam Investments**—2 awards for children of employees of Putnam Investments and its subsidiaries.

* **Quanex Foundation**—3 awards for children of employees of Quanex Building Products and its divisions and subsidiaries.

* **Raytheon Company**—75 awards for children of employees of the company and its subsidiaries.

* **Research Triangle Institute**—2 awards for children of employees of the institute.

* **Rexam Inc. Foundation**—2 awards for children of employees of Rexam Inc. and its subsidiaries.

* **Reynolds American Foundation**—Up to 20 awards for children of employees of Reynolds American Inc. and its eligible subsidiaries.

* **Rheem Manufacturing Company**—5 awards for children of employees of the company and its subsidiaries.

Rockwell Automation—5 awards for Finalists who are children of employees of the corporation and its subsidiaries.

* *This corporate sponsor offers Special Scholarships in addition to Merit Scholarship® awards, and Entry Forms that the sponsor makes available must be filed.*

Corporate scholarship sponsors (continued)

Rockwell Collins—8 awards for Finalists who are children of employees of the corporation and its subsidiaries.

Rolls-Royce North America Inc.—3 awards for Finalists who are children of employees of Rolls-Royce plc and its eligible subsidiaries.

Ryerson Foundation—Every Finalist who is the child of an employee of Ryerson Inc. or a subsidiary will be offered an award.

Sage Software, Inc.—1 award for a Finalist who is the child of an employee of the corporation or its subsidiaries.

* **Schindler Elevator Corporation**—5 awards for children of employees of the corporation.

* **Schneider Electric North America Foundation**—20 awards for children of employees of Schneider Electric North America.

* **Scripps Howard Foundation**—5 awards for children of employees of Scripps Howard and its subsidiaries.

* **Scripps Networks Interactive, Inc.**—2 awards for children of employees of the corporation and its divisions and subsidiaries.

* **Sensient Technologies Foundation**—3 awards for children of employees of Sensient Technologies Corporation and its divisions and subsidiaries.

* **Sentry Insurance Foundation, Inc.**—5 awards for children of employees of Sentry Insurance Group and its eligible subsidiaries.

* **Siemens Foundation**—75 awards for children of employees and dealers of the Siemens Corporation and its designated affiliates.

* **Snap-on Incorporated**—5 awards for children of employees and dealers of the corporation.

Sogeti USA LLC—Every Finalist who is the child of an employee of the corporation will be offered an award.

Solvay America—4 awards for Finalists from specified geographical areas who plan to pursue certain college majors.

* **Sony Electronics Inc.**—3 awards for children of employees of Sony Electronics Inc. and Sony Corporation of America.

Southern Company Services, Inc.—Every Finalist who is the child of an employee of Southern Company or a subsidiary will be offered an award.

Southwest Airlines Co.—5 awards for Finalists who are children of employees of the company.

Spirit AeroSystems, Inc.—7 awards for Finalists who are children of employees of the corporation and its eligible subsidiaries.

* **SRI International**—2 awards for children of employees of the corporation.

* **State Farm Companies Foundation**—100 awards for children of employees and insurance agents of State Farm Companies.

* **Suburban Propane, L.P.**—3 awards for children of employees of the company.

* **Tate & Lyle Americas LLC**—2 awards for children of employees of the corporation and its subsidiaries.

* **TD Ameritrade Services Company, Inc.**—5 awards for children of employees of the company.

* **Teradata Corporation**—4 awards for children of employees of the corporation.

Texas Instruments Incorporated—Every Finalist who is the child of an employee of the corporation will be offered an award.

* **Textron Charitable Trust**—10 awards for children of employees of Textron Inc. and its subsidiaries.

* **J. Walter Thompson Company Fund, Inc.**—3 awards for children of employees of the company and its subsidiaries.

* *This corporate sponsor offers Special Scholarships in addition to Merit Scholarship® awards, and Entry Forms that the sponsor makes available must be filed.*

- * **3M Company**—40 awards for children of employees of the company and its affiliates and subsidiaries.
- * **Tomkins Gates Foundation**—10 awards—5 awards for children of salaried employees of Tomkins Corporation and Gates Corporation and their subsidiaries; 5 awards for children of hourly employees.
- Towers Watson and Company**—5 awards for Finalists who are the children of employees of the company.
- * **The Travelers Employees' Club**—5 awards for children and specified relatives of members of The Travelers Employees' Club.
- * **Tredegear Corporation**—2 awards for children of employees of the corporation and its subsidiaries.

Uhlig LLC—2 awards for Finalists with preference (1st) for the children of employees of the corporation and its eligible subsidiaries; (2nd) for those from the state of Kansas planning certain college majors.

United Services Automobile Association—Every Finalist who is the child of an employee of the company will be offered an award.

- * **United States Fire Insurance Company**—3 awards for children of employees of Crum&Forster.
- * **The UPS Foundation**—180 awards—150 awards for children of full-time employees and 30 awards for children of part-time employees of UPS and its subsidiaries.
- * **USG Foundation, Inc.**—8 awards for children of employees of USG Corporation and its subsidiaries.

- * **Utility Workers Union of America, AFL-CIO**—2 awards for children of members of the union.

Varian Medical Systems—2 awards for Finalists who are children of employees of the corporation.

- * **Vulcan Materials Company Foundation**—3 awards for children of employees of Vulcan Materials Company and its subsidiaries.

Walgreen Co.—Every Finalist who is the child of an employee of the company will be offered an award.

Waste Management—Every Finalist who is the child of an employee of Waste Management Inc.'s family of companies will be offered an award.

Weatherford International, LLC—Every Finalist who is the child of an employee of the corporation and its eligible subsidiaries will be offered an award.

- * **Wirtz Corporation**—5 awards for children of employees of the corporation and its subsidiaries.
- * **Wm. Wrigley Jr. Company**—Up to 7 awards for children of employees of the company and its subsidiaries.
- The Xerox Foundation**—Every Finalist who is the child of an employee of Xerox Corporation or a subsidiary will be offered an award.
- * **Zoetis Inc.**—5 awards for children of employees of the corporation.

* *This corporate sponsor offers Special Scholarships in addition to Merit Scholarship® awards, and Entry Forms that the sponsor makes available must be filed.*

College Merit Scholarship® sponsors. The higher education institutions listed below currently are sponsors of National Merit Scholarships. The number in parentheses reflects the minimum number of Merit Scholarship awards NMSC expects the college to offer annually. However, neither the institution nor NMSC is obligated to offer these scholarships in 2016, 2017, or beyond.

Abilene Christian University (3)
Alma College (3)
American University (10)
Arizona State University,
and identified campuses (85)
Auburn University (55)
Ball State University (3)
Baylor University (35)
Belmont University (3)
Bethel University (3)
Boston College (7)
Boston University (15)
Bowdoin College (3)
Bradley University (3)
Brandeis University (10)
Brigham Young University (10)
Bucknell University (3)
Butler University (3)

Calvin College (16)
Carleton College (60)
Case Western Reserve University (25)
Centre College (3)
Claremont McKenna College (8)
Clemson University (25)
Colby College (Maine) (3)
College of Charleston (3)
College of Wooster (3)
Colorado College (6)
Colorado State University (3)
Concordia College (Minnesota) (3)
Creighton University (3)
Davidson College (3)
Denison University (3)
DePauw University (5)
Dickinson College (3)

Drake University (3)
Emory University (20)

Florida State University (15)
Fordham University,
and identified campuses (3)
Franklin and Marshall College (3)
Furman University (15)
George Washington University (15)
Gordon College (Massachusetts) (3)
Goshen College (3)
Grinnell College (15)
Gustavus Adolphus College (5)
Harding University (10)
Harvey Mudd College (30)
Hendrix College (7)
Hillsdale College (3)
Hope College (6)

Illinois Wesleyan University (3)
Indiana University Bloomington (6)
Iowa State University (35)
Ithaca College (3)
Kalamazoo College (3)
Kansas State University (5)
Kenyon College (5)
Knox College (3)
Lawrence University (Wisconsin) (3)
Lehigh University (3)
Lewis & Clark College (Oregon) (5)
Liberty University (3)
Louisiana State University (25)
Louisiana Tech University (3)
Loyola University Chicago (3)
Luther College (3)
Macalester College (25)
Marquette University (3)
Messiah College (3)
Miami University-Oxford (15)
Michigan State University (35)
Michigan Technological University (3)
Mississippi State University (10)
Missouri University of Science and Technology (9)
Montana State University-Bozeman (3)
New College of Florida (3)

North Dakota State University (3)
Northeastern University (Massachusetts) (3)
Northwestern University (50)

Oberlin College (30)
Occidental College (3)
Ohio University-Athens (6)
Oklahoma Christian University (3)
Oklahoma City University (3)
Oklahoma State University (10)
Franklin W. Olin College of Engineering (3)
Oregon State University (5)
Ouachita Baptist University (3)
Pennsylvania State University,
and identified campuses (5)
Pepperdine University (5)
Pomona College (6)
Purdue University (30)
Rensselaer Polytechnic Institute (15)
Rhodes College (11)
Rochester Institute of Technology (7)
Rose-Hulman Institute of Technology (15)
Rutgers, The State University of New Jersey,
and identified campuses (15)

Saint Louis University (3)
St. Olaf College (20)
Samford University (5)
Santa Clara University (4)
Scripps College (3)
South Dakota State University (3)
Southern Methodist University (15)
Southwestern University (Texas) (3)
Stony Brook University (3)
Tennessee Technological University (3)
Texas A&M University (110)
Texas Christian University (3)
Texas Tech University (3)
Transylvania University (3)
Trinity University (Texas) (3)
Truman State University (3)
Tufts University (10)
Tulane University (20)

University of Alabama at Birmingham (5)
University of Alabama at Tuscaloosa (30)
University of Arizona (55)
University of Arkansas, Fayetteville (20)
University of Central Florida (10)
University of Chicago (60)
University of Cincinnati (10)
University of Dallas (15)
University of Dayton (3)
University of Evansville (3)
University of Florida (20)
University of Georgia Foundation (20)
University of Houston-Main Campus (10)
University of Idaho (15)
University of Iowa (20)
University of Kansas (28)
University of Kentucky (10)
University of Louisville (12)
University of Maine (3)
University of Maryland,
and identified campuses (15)
University of Miami (15)
University of Minnesota,
and identified campuses (36)
University of Mississippi (10)
University of Missouri-Columbia (20)
University of Missouri-Kansas City (3)
University of Montana-Missoula (3)
University of Nebraska-Lincoln (20)
University of Nevada, Las Vegas (3)
University of Nevada, Reno (3)
University of New Mexico (3)
University of North Dakota (3)
University of North Texas (3)
University of Oklahoma,
and identified campuses (30)
University of Oregon (6)
University of Pittsburgh (3)
University of Puget Sound (3)
University of Richmond (10)
University of Rochester (20)
University of St. Thomas (Minnesota) (3)
University of the South (5)
University of South Carolina,
and identified campuses (8)

University of South Florida (12)
University of Southern California (35)
University of Southern Mississippi (5)
University of Tennessee, Knoxville (15)
University of Texas at Dallas (24)
University of Tulsa (40)
University of Utah (20)
University of Vermont (3)
University of Wisconsin-Eau Claire (3)
University of Wisconsin-Madison (5)
University of Wyoming (3)
Ursinus College (3)

Valparaiso University (3)
Vanderbilt University (18)
Villanova University (5)

Washington and Lee University (15)
Washington State University (3)
Wayne State University (Michigan) (10)
West Virginia University Foundation, Inc. (12)
Western Washington University (3)
Westmont College (3)
Wheaton College (Illinois) (20)
Whitman College (5)
Wichita State University (3)
Willamette University (3)
Wofford College (3)
Worcester Polytechnic Institute (10)
Xavier University (Ohio) (3)

OCTOBER 2015

Official Student Guide to the PSAT/NMSQT®

Preliminary SAT/National Merit Scholarship Qualifying Test



INFORMATION
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PSAT/NMSQT®



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ADVICE AND TIPS



AN OFFICIAL
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The PSAT/NMSQT®

The Preliminary SAT/National Merit Scholarship Qualifying Test (PSAT/NMSQT®) is cosponsored by the College Board and National Merit Scholarship Corporation. It is administered for the College Board and National Merit Scholarship Corporation by Educational Testing Service (ETS).

Contact the PSAT/NMSQT office if you have suggestions, questions, or comments about test registration, administration, or score reports. If you wish to withdraw your answer sheet from scoring, or if you wish to report test administration irregularities, you must notify the test supervisor or the PSAT/NMSQT office immediately.

PSAT/NMSQT Office:

Write: PSAT/NMSQT
P.O. Box 6720
Princeton, NJ 08541-6720

Email: psathelp@info.collegeboard.org

Call: 866-433-7728 (U.S.), +1-212-713-8105 (International)
609-882-4118 TTY
8 a.m. to 4 p.m. ET

Fax: 610-290-8979

The College Board

The College Board is a mission-driven not-for-profit organization that connects students to college success and opportunity. Founded in 1900, the College Board was created to expand access to higher education. Today, the membership association is made up of more than 6,000 of the world's leading educational institutions and is dedicated to promoting excellence and equity in education. Each year, the College Board helps more than seven million students prepare for a successful transition to college through programs and services in college readiness and college success—including the SAT® and the Advanced Placement Program®. The organization also serves the education community through research and advocacy on behalf of students, educators, and schools. For more information, visit collegeboard.org.

The College Board

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New York, NY 10080-0001

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National Merit Scholarship Corporation (NMSC)

NMSC is an independent, not-for-profit organization that operates without government assistance. NMSC conducts the National Merit® Scholarship Program, an annual academic competition for recognition and college scholarships. The PSAT/NMSQT is the screening test for high school students who wish to participate in the National Merit Scholarship Program. Further information can be found in the NMSC section on the flip side of this publication or by visiting the website www.nationalmerit.org.

Please direct inquiries about any aspect of the National Merit Scholarship Program, including student participation requirements, the selection process, and awards offered, to:

National Merit Scholarship Corporation

1560 Sherman Avenue, Suite 200

Evanston, IL 60201-4897

847-866-5100

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*If you don't have a Practice Test, ask your counselor for one.

Important Information About Taking the PSAT/NMSQT®

Test Dates:

Primary Test Date: Wednesday, Oct. 14, 2015
Alternate Test Date: Wednesday, Oct. 28, 2015

What does the PSAT/NMSQT measure?

The PSAT/NMSQT® measures reading, writing and language, and math skills developed over many years, both in and out of school.

You will not be asked to recall facts from literature, history, or science, or to complete math formulas, because this test measures your reasoning and critical thinking skills.

Why take the test?

- » See your scores online and learn more about what they mean at collegeboard.org/psatscoring
- » Get free, personalized, and focused practice through Khan Academy®
- » Prepare for the SAT®
- » Start getting ready for college
- » Enter scholarship competitions
- » See which AP® courses you might be ready for

What is the test fee?

The fee for the 2015 PSAT/NMSQT is \$15. Schools sometimes charge an additional fee to cover administrative costs. The College Board makes fee waivers available for juniors from low-income families who meet our income guidelines. See your counselor for more information about fee waivers.

Whom should I contact if I have questions?

See your counselor. For further help, see contact information on page ii for the PSAT/NMSQT office, the College Board, and National Merit Scholarship Corporation (NMSC).

What should I bring on test day?

- » No. 2 pencils with erasers
- » Approved calculator (see page 32)
- » Social Security number (optional)
- » Student ID number, assigned by your school (optional)
- » Email address (optional)
- » Current and valid school- or government-issued photo ID if you are not testing at the school you

normally attend (More ID information is given at sat.org/id-requirements.)

Online preparation and resources:

- » Go to collegeboard.org/psatpractice for sample questions and practice test answer explanations.
- » Go to collegeboard.org/psatscoring to get more information about scoring and linking to practice.

PSAT/NMSQT Scores

What scores will I receive?

In January, your school will receive your PSAT/NMSQT Score Report, which will be given to you in the following weeks. Your score report will include a total score, section scores, test scores, cross-test scores, and subscores — all of which will give you better insight into your performance. Your score report will also include the NMSC Selection Index, which is calculated by doubling the sum of your Reading, Writing and Language, and Math Test scores. NMSC uses the Selection Index as an initial screen of the large number of entrants to its National Merit® Scholarship Program. Once you get your score, visit studentscores.collegeboard.org to learn more about what these scores mean.

The score report will also show the correct answers, the answers you gave, and the difficulty level of each question. In the Next Steps section, you will see a message about your potential for success in AP courses based on your scores. There is also some helpful advice about when to take the SAT. If you have not received your score report by mid-January, see your counselor. The PSAT/NMSQT Program does not provide duplicate copies of score reports, but your school will be able to print a copy.

Does anyone else receive my scores and information I provide on my answer sheet?

Please refer to the "Test Regulations" section to learn more about who receives your scores and other personal information.

Special Opportunities

If you take the PSAT/NMSQT as a junior and qualify for participation, the following programs may help you prepare for college. If you do not want your name, scores, and other information released to them, write to the PSAT/NMSQT office by Oct. 31, 2015.

PSAT/NMSQT
P.O. Box 6720
Princeton, NJ 08541-6720

- » The National Hispanic Recognition Program (NHRP) identifies outstanding Hispanic/Latino students and shares information about them with interested colleges and universities. To be eligible, you must be at least one-quarter Hispanic/Latino, as defined by the NHRP, and meet a minimum PSAT/NMSQT cutoff score for your state, as well as a minimum grade point average.

The College Board
National Hispanic Recognition Program
250 Vesey Street
New York, NY 10080-0001
877-358-6777

- » The National Scholarship Service (NSS) offers a free college advisory and referral service for students who plan to attend two-year or four-year colleges. Scores will be sent for juniors who indicate that they are African American or black.

National Scholarship Service
230 Peachtree Street, Suite 530
Atlanta, GA 30303
404-522-7260

- » Telluride Association offers scholarships to highly gifted juniors for summer seminars in the humanities and social sciences.

Telluride Association
217 West Avenue
Ithaca, NY 14850
607-273-5011

Student Search Service®

Our Student Search Service® is a voluntary program that connects students with information about educational and financial aid opportunities from more than 1,200 colleges, universities, scholarship programs, and educational organizations. Here's how it works:

1. Students may choose to participate in Student Search Service when registering for a College Board test.
2. As part of taking the PSAT/NMSQT, students are asked to provide information about themselves on their answer sheet.
3. Participating, eligible organizations can then search for groups of students who may be a good fit for their communities and programs, but only among those students who opt to participate in Student Search Service.
4. The search criteria can include any attribute from the answer sheet; however, we never share information on disabilities, parental education, self-reported parental income, Social Security numbers, phone numbers, and actual test scores.

5. The most searched items are expected high school graduation date, cumulative grade point average (GPA), and intended college major.

If you have questions or concerns about Student Search Service or want more information about the program, please go to collegeboard.org/student-search-service or call 866-825-8051.

Here are some points to keep in mind about Student Search Service:

- » Colleges participating in Student Search Service never receive student scores or phone numbers. Colleges can ask for names of students within certain score ranges, but your exact score is not reported.
- » Being contacted by a college doesn't mean you have been admitted. You must submit an application in order to be considered for admission. The colleges and organizations that participate want to find students who fit in with their environment, classes, programs, scholarships, and special activities. Student Search Service is simply a way for colleges to reach prospective students like you and inform them of their opportunities.
- » Student Search Service will share your contact information only with colleges and qualified non-profit educational or scholarship programs that are recruiting students like you. Your name will never be sold to a commercial marketing firm or retailer of merchandise or services (such as test prep).

Student Search Service communications are sent by outside colleges, scholarship programs, and educational opportunity organizations. See the "Test Regulations" section to learn how we protect your privacy.

Telemarketing and Internet Scams

- » From time to time, we receive reports of phone scams in which callers posing as employees of the College Board contact students and families attempting to sell test-preparation products, or otherwise requesting sensitive personally identifying information, such as credit card and Social Security numbers. Some of these callers engage in illegal spoofing to make it seem as if the call is coming from the actual company. **These calls do not come from the College Board. The College Board does not make unsolicited phone calls to students or families requesting this type of information.** This type of activity, known as telemarketing fraud, is a crime. Should you receive an unsolicited phone call from someone claiming to work for the College Board, including where your Caller ID indicates that the telephone number originates from a College Board location, do not provide the caller with any personal information.

If you provide your phone number on your answer sheet, representatives of the College Board will only call or send text messages to you and your family in response to inquiries generated by you, to provide or gather information about a test or program for which you registered, or regarding an invitation to participate in free college planning services. Should you have a question about the origin of a phone call you have received in which the caller claimed to be from the College Board, contact the PSAT/NMSQT office (see page ii).

Safety and Security Tips

1. Be wary of unsolicited contacts, whether via telephone or email.
2. Remember that the College Board will never contact you to ask you to send your credit card, bank account, or password information over the telephone or through email.
3. Never supply credit card information to someone who calls or emails you.
4. If you suspect you have received a fraudulent call or email, contact the Federal Trade Commission (FTC) and your local authorities and provide them with all the details.
5. Keep in mind that if an offer appears too good to be true, it probably is.
6. To make a complaint, and to obtain more information about protecting yourself from telephone and Internet scams, visit the FTC's Consumer Information site at consumer.ftc.gov.

Other Testing Questions You May Have

What to do if...

- » **you know in advance that you cannot take the test on the date your school offers it:**

Your school may be able to arrange for you to take the test at a neighboring school that has selected the other test date offered. Tell your counselor as soon as possible that you have a conflicting commitment, such as a religious observance. If you test at another school, be sure to take your school's code number and an acceptable photo identification with you.

- » **you are home-schooled and want to take the PSAT/NMSQT:**

You must make arrangements in advance with your local high school or other nearby school administering the test. (For a listing of schools in your area, go to collegeboard.org/psat.) If this is not possible, contact the PSAT/NMSQT office (see page ii).

» **you will be studying in another country when the test is given:**

You must make advance arrangements. Contact the PSAT/NMSQT office and provide the name of the city and country and, if known, the name and address of the school you will be attending when the test is given. The PSAT/NMSQT office will send you instructions.

» **you missed the test but want to enter scholarship and recognition programs:**

For information about another route of entry to the National Merit Scholarship Program, see the box on page 7 of the NMSC section in the flip side of this *Student Guide*.

Students with Disabilities

The College Board provides testing accommodations for students with documented disabilities. If you have not already been approved for accommodations by the College Board, it is important to speak to your counselor or teacher right away to determine if a request for accommodations needs to be submitted. If so, your school's SSD Coordinator will use the SSD Online system to request the accommodations that meet the needs of your disability.

- » After the eligibility request has been submitted, it may take approximately 7 weeks for you to receive a decision letter. If you are approved for accommodations, save this letter because it also indicates your eligibility for accommodations on other College Board tests, such as the SAT and Advanced Placement Program® (AP) Exams. With limited exceptions, the accommodations will remain in effect until one year after your graduation. If you move to a new school, ask your counselor at your new school to transfer your SSD online record.
- » If you are interested in participating in the National Merit Scholarship Program and did not receive accommodations for which you were approved or did not receive approval in time for the test, please contact NMSC immediately but no later than Nov. 15, 2015.

Test Regulations

Standard rules and regulations give all students the same opportunity and prevent any student from having an unfair advantage. When you take the test, you will be asked to copy and sign a Certification Statement stating that you will abide by these regulations, so read them carefully. Also read about grounds for score cancellation on page 5. Failure to follow these test regulations or any instructions given by the test supervisor may result in your scores being canceled.

Use and Distribution of Scores and Student Information

When you take the PSAT/NMSQT and sign the answer sheet, you acknowledge that you understand how your scores and personal information will be used.

As cosponsors of the PSAT/NMSQT, the College Board and NMSC receive the scores of students who take the test as well as information students provide on their answer sheets.

Some school districts and states receive PSAT/NMSQT scores with other information about their students. In addition, scores for students who qualify for programs described in the section "Special Opportunities" are reported to those programs. The PSAT/NMSQT Program does not report scores to colleges or commercial entities.

If your school participates in the PSAT/NMSQT through a bulk registration process, the College Board may receive your personal information, including first name, last name, sex, date of birth, and mailing address, from your school. This information will be kept secure and added to your permanent College Board record to be used for score reporting purposes as well as the other purposes that are outlined in this guide and in registration materials. By taking the PSAT/NMSQT and signing the PSAT/NMSQT answer sheet, you acknowledge that your school has provided this information to the College Board and consent to the College Board retaining this information.

Student Search Service and Protecting Your Privacy

All entities who receive student information from Student Search Service are required to maintain strict confidentiality. We actively monitor these entities to ensure adherence to our guidelines. The frequency and mode of communication

is determined by the entity that receives the student's name. Every communication from individual entities is required to contain specific instructions on how to unsubscribe from that particular institution. To unsubscribe from the entire Student Search Service program, go to **collegeboard.org/student-search-service**, call 800-626-9795, or write to:

The College Board
11955 Democracy Drive
Reston, VA 20190-5662
Attention: Student Search Service

Test-Day Regulations

- » You must mark your answers on the answer sheet. You will not receive credit for anything written in the test book. You may not leave the room with your test book. You may use only your test book for scratch work (unless approved for an accommodation).
- » You may use an approved calculator (see page 32) only during the Math – Calculator portion of the test; you may not have a calculator on your desk during the Reading or the Writing and Language sections, and you may not share a calculator during the test or during breaks. You may only use one calculator at any given time — if you brought a second one for backup, it must be kept under your desk.
- » You are not allowed to use: protractors; compasses; rulers; cutting devices; earplugs; scratch paper, notes, books, dictionaries, or references of any kind; pamphlets; pens, mechanical pencils, highlighters, or colored pencils; listening, recording, copying, or photographic devices; or any other aids. You may not bring food or drink (including bottled water) into the test room, unless preapproved for medical reasons.
- » You may not use cell phones or other prohibited electronic devices during the test or breaks. Prohibited devices include but are not limited to: cellphones or smartphones; audio players/recorders, tablets, laptops, notebooks, or any other personal computing devices; separate timers of any type; cameras or other photographic equipment; any devices (including smartwatches) that can be used to record, transmit, receive, or play back audio, photographic, text, or video content. Power must be turned off, and these devices must be placed under your desk. If your watch has an alarm, you must turn that off as well. If your phone makes noise, or you are seen using it at any time (including breaks), you will be dismissed immediately, your scores will be canceled, and the device may be confiscated and its contents inspected.
- » You may not give or receive assistance or disturb others during the test or breaks.
- » You cannot skip ahead or go back to a previous test section while taking the PSAT/NMSQT.
- » You may take the PSAT/NMSQT only once each school year. If you begin a test, you are considered to have taken it.
- » All PSAT/NMSQT test-takers in your school must take the test at the same time. (Read about special arrangements and testing accommodations for students with disabilities on page 4.)
- » If you become ill and/or must leave during the test, or if for any other reason you do not want your test scored, you may ask the test supervisor to destroy your answer sheet before you leave the testing room. After you leave the testing room, any decision to withdraw your answer sheet from scoring must be reported immediately to the test supervisor or the PSAT/NMSQT office. (See contact information on page ii.)
- » You may not discuss the contents of the test with anyone else, or share them through any means, including, but not limited to, emails, text messages, and the Internet until after score reports have been distributed.
- » Members of your household or immediate family may not serve as PSAT/NMSQT supervisors, coordinators, or proctors, even at a different school, on the date that you take the test.

Grounds for Score Cancellation

To report scores that accurately reflect performance, ETS, on behalf of the College Board and NMSC, maintains test administration and security standards designed to give all students the same opportunity to demonstrate their abilities and to prevent any student from gaining an unfair advantage because of testing irregularities or misconduct. ETS reviews irregularities and test scores believed to have been earned under unusual circumstances.

- » Students may be dismissed from the testing room and their answer sheets may be destroyed if they fail to follow test regulations or instructions given by the test supervisor. Once answer sheets are submitted for scoring, ETS reserves the right not to score the answer sheet of a student who engaged in misconduct or was involved in a testing irregularity.
- » ETS reserves the right to cancel scores if there is reason to doubt their validity. Before acting, ETS will inform the student of the reasons for questioning the scores and will give the student an opportunity to provide additional information, to confirm the scores by taking

another PSAT/NMSQT, or to cancel the scores. The student may also request arbitration in accordance with ETS's Standard Arbitration Agreement. If before, during, or after a review of questionable scores, ETS finds that misconduct has occurred in connection with a test, these options will not be available even if previously offered.

- » Score reviews are confidential. If it is necessary to cancel reported scores, ETS will notify score users, but the reasons for cancellation will not be disclosed. This policy does not necessarily apply in group cases.
- » ETS will forward all reports of misconduct or testing irregularities to NMSC, which reserves the right to make its own independent judgment about a student's participation in the National Merit Scholarship Program.

Test Fairness Review

All new PSAT/NMSQT test questions and complete new editions of the tests are reviewed by external, independent educators from throughout the United States. These reviews help ensure that wording or content are unambiguous and relevant and that the language used is not offensive to or inappropriate for any particular group of students based on race/ethnicity or gender. Assessment staff ensure that the test as a whole includes references to men and women as well as to individuals from varied racial, ethnic, and cultural backgrounds. Statistical procedures are used to identify questions that are harder for a group of students to answer correctly than would be expected from their performance on other items in the test; these questions are excluded from appearing on tests.

Questioning a Test Question

If you find what you consider to be an error or ambiguity in a test question, tell the test supervisor immediately after the test. You may also write to: **Assessment Design and Development, The College Board, 250 Vesey Street, New York, NY 10281**; or send an email to: **psatquestion@collegeboard.org**.

- » In your inquiry, state your name and mailing address, the date you took the PSAT/NMSQT, the name and address of the school where you took the test, the test section, the test question (as well as you can remember), and an explanation of your concern about the question.

NOTE: *We will not respond via email, so be sure to include your full name and mailing address.*

- » The PSAT/NMSQT Program will send you a written response after your inquiry has been reviewed thoroughly by subject-matter specialists.

College Major Codes

When you take the PSAT/NMSQT, indicate the college major that best matches your interests by entering the code from the list that follows on your answer sheet. Your online score report will include information to help you investigate this and other majors further.

If you say "Yes" to Student Search Service, colleges and universities that offer degrees in your areas of interest can send you information about their programs.

Agriculture, Agriculture Operations, and Related Sciences—100

Agricultural Business and Management—101
Animal Sciences—103

Architecture and Related Services—120

Architecture—121
City/Urban, Community, and
Regional Planning—123
Landscape Architecture—125

Area, Ethnic, Cultural, Gender, and Group Studies—140

Area Studies—141
Ethnic, Cultural Minority, Gender,
and Group Studies—142

Biological and Biomedical Sciences—160

Biochemistry—162
Biology/Biological Sciences, General—161
Biophysics—163
Biotechnology—164
Cell/Cellular Biology and
Anatomical Sciences—166
Ecology—167
Genetics—168
Marine Biology and Biological
Oceanography—169
Microbiological Sciences and Immunology—170
Molecular Biology—171
Neuroscience—185
Zoology/Animal Biology—175

Business Management, Marketing, and Related Support Services—200

Accounting and Related Services—201
Actuarial Science—202

Business Administration, Management, and Operations—204	Environmental/Environmental Health Engineering—463
Fashion Merchandising—208	Geological/Geophysical Engineering—464
Finance and Financial Management Services—209	Industrial Engineering—465
Hospitality Administration/ Management—211	Materials Engineering—466
Hotel, Motel, and Restaurant Management—225	Mechanical Engineering—467
Human Resources Management and Services—212	Mining and Mineral Engineering—468
International Business—214	Nuclear Engineering—470
Management Information Systems and Services—217	Petroleum Engineering—472
Marketing/Marketing Management—218	Polymer/Plastics Engineering—475
Meeting and Event Planning—230	
Communication, Journalism, and Related Programs—250	Engineering Technologies—500
Communication and Media Studies—252	Computer Engineering Technology—501
Digital Communication and Media/ Multimedia—253	Drafting/Design Engineering Technologies—502
Journalism—254	Telecommunications Technology/ Technician—509
Public Relations, Advertising, and Applied Communication—270	
Radio and Television—257	English Language and Literature/ Letters—520
	Creative Writing—522
Computer and Information Sciences and Support Services—300	Family and Consumer Sciences/ Human Sciences—540
Artificial Intelligence—301	Foods, Nutrition, and Wellness Studies—542
Computer Programming—302	
Computer Science—303	Foreign Languages, Literatures, and Linguistics—550
Computer Systems Networking and Telecommunications—306	Classics and Classical Languages, Literatures, and Linguistics—553
Information Sciences/Studies—308	Comparative Literature—554
	East Asian Languages, Literatures, and Linguistics—555
Education—400	French Language and Literature—556
Early Childhood Education and Teaching—407	German Language and Literature—557
Elementary Education and Teaching—417	Linguistics—559
Secondary Education and Teaching—430	Russian Language and Literature—560
Special Education and Teaching—432	Spanish Language and Literature—561
Engineering—450	Health Professions and Related Programs—600
Aerospace, Aeronautical, and Space Engineering—451	Allied Health Diagnostic, Intervention, and Treatment Professions—602
Agricultural Engineering—452	Athletic Training/Trainer—603
Architectural Engineering—453	Clinical/Medical Laboratory Science/ Research and Allied Professions—605
Bioengineering and Biomedical Engineering—454	Communication Sciences and Disorders—606
Chemical Engineering—455	Dental Hygiene/Hygienist—607
Civil Engineering—456	Dietetics and Clinical Nutrition Services—610
Computer Engineering, General—457	Nursing—619
Electrical and Electronics Engineering—459	Pedentistry Studies—627
Engineering Physics/Applied Physics—461	Premedicine/Premedical Studies—628
Engineering Science—462	Preoccupational Therapy Studies—678
	Prepharmacy Studies—629
	Prephysical Therapy Studies—682
	Preveterinary Studies—630

History—700

**Homeland Security, Law Enforcement,
Firefighting, and Related
Protective Services—890**

Criminal Justice/Law Enforcement
Administration—892

Forensic Science and Technology—894

Homeland Security—897

Legal Professions and Studies—710

Prelaw Studies—712

**Liberal Arts and Sciences, General
Studies, and Humanities—720**

Humanities/Humanistic Studies—722

Liberal Arts and Sciences/Liberal Studies—723

Mathematics and Statistics—740

Applied Mathematics—741

Mathematics—742

Statistics—743

Military Technologies and Applied Sciences—360

Multi/Interdisciplinary Studies—770

Biological and Physical Sciences—771

International/Global Studies—772

Mathematics and Computer Science—773

Natural Resources and Conservation—790

Environmental Science—791

Environmental Studies—792

Fishing and Fisheries Sciences
and Management—793

Forestry—794

Wildlife, Fish, Wildlands Science/
Management—796

**Parks, Recreation, Leisure, and
Fitness Studies—800**

Parks and Recreation Facilities
Management—802

Sport and Fitness Administration/
Management—803

Personal and Culinary Services—810

Philosophy and Religious Studies—820

Philosophy—821

Religion/Religious Studies—822

Physical Sciences—830

Astronomy—832

Astrophysics—833

Atmospheric Sciences and Meteorology—834

Chemistry—836

Geological and Earth Sciences/
Geosciences—837

Materials Science—854

Physics—843

Psychology—870

Public Administration and Social Services—880

Human Services, General—881

Public Administration—882

Public Policy Analysis—883

Social Work—884

Social Sciences—900

Anthropology—901

Archaeology—902

Criminology—903

Economics—904

Geography—905

International Relations and Affairs—906

Political Science and Government—907

Sociology—908

Theology and Religious Vocations—920

Visual and Performing Arts—940

Art History, Criticism, and Conservation—941

Arts, Entertainment, and Media
Management—960

Dance—942

Drama and Theater Arts—943

Fashion/Apparel Design—945

Film/Video and Photographic Arts—946

Fine and Studio Art—947

Game and Interactive Media Design—970

Graphic Design—948

Interior Design—949

Music—950

Photography—954

Technical Theater/Theater Design
and Technology—955

OTHER—990

UNDECIDED—999

Evidence-Based Reading and Writing

Reading Test Overview

The Reading Test gives you a chance to show how well you understand what you read.

- » Total questions: 47 questions with multiple-choice responses
- » Time allotted: 60 minutes
- » Calculators may not be used or be on your desk.

Tips for the Reading Test

- » The test is comprised of a series of passages, sometimes accompanied by supplementary material (such as graphs) and associated multiple-choice questions. To answer each question, consider what the passage(s) say directly and use careful reasoning to draw supportable inferences and conclusions from the passage(s). The best answer to each question is derived from what is stated or implied in the passage(s) rather than from prior knowledge of the topics covered.
- » Reading carefully is the key to finding the best answer to each question. The information you need to answer each Reading question is always in the passage(s). Don't be misled by an answer that looks correct but is not supported by the actual text of the passage(s).
- » The questions do not increase in difficulty from easy to hard. Instead, they are presented as logically as possible, with general questions about central ideas, themes, point of view, overall text structure, and the like coming early in the sequence. After that come more specific questions about such matters as facts, details, and words in context.
- » Stay with a passage until you have answered as many questions as you can before you proceed to the next passage. Do not jump from passage to passage.
- » The questions often include line numbers to help direct you to the relevant part(s) of the passage(s). You may have to look elsewhere in the passage, however, in order to find the best answer to the question.
- » In your test booklet, mark each question you skip so that you can easily go back to it later if you have time.

- » Remember that all questions are worth one point regardless of the type or difficulty. You are not penalized for guessing wrong, so it's to your advantage to answer each question as best you can.

About the Passages

The passages range in length from about 500 to 750 words, and they are taken from a variety of fields, including U.S. and world literature, history/social studies, and science. Some passages are accompanied by informational graphics such as tables, graphs, or charts; questions ask you to interpret the data presented and to synthesize information and ideas presented with those in the associated passage. (Mathematical computation is, however, not required to answer these questions.)

Other questions ask you to interpret the meaning of words and phrases in context and to analyze how word choice influences meaning, mood, tone, or point of view. Passages that have similar subject matter are sometimes paired and accompanied by questions that require you to make important connections between the passages as well as to understand each passage on its own.

Answering Reading Questions

Following are samples of the kinds of Reading passages and questions that may appear on your test. For each set of sample materials:

- » Read the passage carefully.
- » Decide on the best answer to each question.
- » Read the explanation for the best answer.

The directions provided match what you will see on the actual test.

DIRECTIONS

Each passage or pair of passages below is followed by a number of questions. After reading each passage or pair, choose the best answer to each question based on what is stated or implied in the passage or passages and in any accompanying graphics (such as a table or graph).

Questions 1-4 are based on the following passage.

This passage is adapted from Edith Wharton, *Ethan Frome*, originally published in 1911. Mattie Silver is Ethan's household employee.

Line Mattie Silver had lived under Ethan's roof for a year,
and from early morning till they met at supper he
had frequent chances of seeing her; but no moments
5 in her company were comparable to those when,
her arm in his, and her light step flying to keep time
with his long stride, they walked back through the
night to the farm. He had taken to the girl from the
first day, when he had driven over to the Flats to
meet her, and she had smiled and waved to him from
10 the train, crying out, "You must be Ethan!" as she
jumped down with her bundles, while he reflected,
looking over her slight person: "She don't look much
on housework, but she ain't a fretter, anyhow." But
it was not only that the coming to his house of a bit
15 of hopeful young life was like the lighting of a fire
on a cold hearth. The girl was more than the bright
serviceable creature he had thought her. She had
an eye to see and an ear to hear: he could show her
things and tell her things, and taste the bliss of feeling
20 that all he imparted left long reverberations and
echoes he could wake at will.

It was during their night walks back to the farm
that he felt most intensely the sweetness of this
communion. He had always been more sensitive
25 than the people about him to the appeal of natural
beauty. His unfinished studies had given form to
this sensibility and even in his unhappiest moments
field and sky spoke to him with a deep and powerful
persuasion. But hitherto the emotion had remained
30 in him as a silent ache, veiling with sadness the
beauty that evoked it. He did not even know whether
any one else in the world felt as he did, or whether
he was the sole victim of this mournful privilege.
Then he learned that one other spirit had trembled
35 with the same touch of wonder: that at his side, living
under his roof and eating his bread, was a creature to
whom he could say: "That's Orion down yonder; the
big fellow to the right is Aldebaran, and the bunch
of little ones—like bees swarming—they're the
40 Pleiades . . ." or whom he could hold entranced before
a ledge of granite thrusting up through the fern

while he unrolled the huge panorama of the ice age,
and the long dim stretches of succeeding time. The
fact that admiration for his learning mingled with
45 Mattie's wonder at what he taught was not the least
part of his pleasure. And there were other sensations,
less definable but more exquisite, which drew them
together with a shock of silent joy: the cold red of
sunset behind winter hills, the flight of cloud-flocks
50 over slopes of golden stubble, or the intensely blue
shadows of hemlocks on sunlit snow. When she said
to him once: "It looks just as if it was painted!" it
seemed to Ethan that the art of definition could go no
farther, and that words had at last been found to utter
55 his secret soul. . . .

As he stood in the darkness outside the church
these memories came back with the poignancy of
vanished things. Watching Mattie whirl down the
floor from hand to hand he wondered how he could
60 ever have thought that his dull talk interested her.
To him, who was never gay but in her presence, her
gaiety seemed plain proof of indifference. The face
she lifted to her dancers was the same which, when
she saw him, always looked like a window that has
65 caught the sunset. He even noticed two or three
gestures which, in his fatuity, he had thought she
kept for him: a way of throwing her head back when
she was amused, as if to taste her laugh before she
let it out, and a trick of sinking her lids slowly when
70 anything charmed or moved her.

1

Over the course of the passage, the main focus of the narrative shifts from the

- A) reservations a character has about a person he has just met to a growing appreciation that character has of the person's worth.
- B) ambivalence a character feels about his sensitive nature to the character's recognition of the advantages of having profound emotions.
- C) intensity of feeling a character has for another person to the character's concern that that intensity is not reciprocated.
- D) value a character attaches to the wonders of the natural world to a rejection of that sort of beauty in favor of human artistry.

Estimated Difficulty: Medium

Key: C

Choice C is the best answer. The first paragraph traces the inception of Ethan's feelings for Mattie: Ethan "had taken to the girl from the first day" (lines 7-8) and saw her as "like the lighting of a fire on a cold hearth" (lines 15-16). The second paragraph (lines 22-55) focuses on "their night walks back to the farm" and

Ethan's elation in perceiving that "one other spirit . . . trembled with the same touch of wonder" that characterized his own (lines 34-35). In other words, the main focus of the first two paragraphs is the intensity of feeling one character, Ethan, has for another, Mattie. The last paragraph shifts the focus of the passage to Ethan's change in perception; he sees Mattie in a social setting interacting with other men, wonders "how he could ever have thought that his dull talk interested her" (lines 59-60), interprets her seeming happiness as "plain proof of indifference" toward him (line 62), and sees betrayal in the "two or three gestures which, in his fatuity, he had thought she kept for him" (lines 65-67).

Choice A is incorrect because while Ethan acknowledges that Mattie "don't look much on housework" (lines 12-13), the first paragraph also notes that Ethan "had taken to the girl from the first day" (lines 7-8); therefore there is no support for the notion that Ethan's "reservations" about Mattie lasted for any length of time or ever constituted the main focus of the narrative.

Choice B is incorrect because while Ethan does exhibit ambivalence about his sensitive nature, seeing it as a "mournful privilege" (line 33), the main focus of the narrative does not shift to his recognition of the advantages of having profound emotions. Indeed, in the last paragraph Ethan's profound emotions give him only grief, as he sees Mattie seemingly rejecting him.

Choice D is incorrect because while the second paragraph (lines 22-55) does discuss in depth the value Ethan attaches to natural beauty, nothing in the passage signifies that he has rejected natural beauty in favor of human artistry. The closest the passage comes to this is in line 52, in which Mattie is said to have likened a natural scene to a painting.

2

In the context of the passage, the author's use of the phrase "her light step flying to keep time with his long stride" (lines 5-6) is primarily meant to convey the idea that

- A) Ethan and Mattie share a powerful enthusiasm.
- B) Mattie strives to match the speed at which Ethan works.
- C) Mattie and Ethan playfully compete with each other.
- D) Ethan walks at a pace that frustrates Mattie.

Estimated Difficulty: Easy

Key: A

Choice A is the best answer. The author uses the phrase mainly to introduce a topic discussed at length in the second paragraph (lines 22-55) — namely, the growing connection Ethan sees himself forming with Mattie over the course of many evening walks during which they share similar feelings for the wonders of the natural world. In the context of the passage, the phrase evokes an image of two people walking eagerly and in harmony.

Choice B is incorrect because while the phrase literally conveys Mattie's attempts to keep up with Ethan's pace, the phrase relates to times of leisure during which Ethan and Mattie walked arm-in-arm (see lines 1-7) rather than times of work. Moreover, the phrase is used primarily in a figurative way to suggest shared enthusiasm (see explanation for choice A).

Choice C is incorrect because while the phrase literally describes Mattie's attempts to keep up with Ethan's pace, the context makes clear that Mattie and Ethan are not in competition with each other; instead, they are enjoying times of leisure during which the two walk arm-in-arm (see lines 1-7). The phrase is used primarily in a figurative way to suggest shared enthusiasm (see explanation for choice A).

Choice D is incorrect because while the phrase in isolation could be read as conveying some frustration on the part of Mattie, who had to expend extra effort to keep up with Ethan's pace, the context makes clear that Mattie is not annoyed with Ethan but is instead enjoying times of leisure during which the two walk arm-in-arm (see lines 1-7). The phrase is used to suggest shared enthusiasm (see explanation for choice A).

3

The description in the first paragraph indicates that what Ethan values most about Mattie is her

- A) fitness for farm labor.
- B) vivacious youth.
- C) receptive nature.
- D) freedom from worry.

Estimated Difficulty: Easy

Key: C

Choice C is the best answer. Lines 9-16 mention many of Mattie's traits: she is friendly ("smiled and waved"), eager ("jumped down with her bundles"), easygoing ("she ain't a fretter"), and energetic ("like the lighting of a fire on a cold hearth"). However, the trait that appeals the most to Ethan, as suggested by it being mentioned last in the paragraph, is her openness

to the world around her: “She had an eye to see and an ear to hear: he could show her things and tell her things, and taste the bliss of feeling that all he imparted left long reverberations and echoes he could wake at will” (lines 17-21).

Choice A is incorrect because the passage suggests that Ethan does not actually view Mattie as particularly well suited to farm labor. When first seeing Mattie, Ethan thinks to himself, after “looking over her slight person,” that “she don’t look much on housework” (lines 12-13).

Choice B is incorrect because the passage suggests that Mattie’s youth is not what Ethan values most about Mattie. Although the passage does note that “the coming to his house of a bit of hopeful young life was like the lighting of a fire on a cold hearth” (lines 14-16), the narrator goes on to note that “the girl was more than the bright serviceable creature [Ethan] had thought her” (lines 16-17), indicating that Ethan values something more in Mattie than simply her vivacity.

Choice D is incorrect because, although Ethan acknowledges that Mattie “ain’t a fretter” (line 13), there is no evidence that Mattie’s freedom from worry is what Ethan values most about Mattie. The first paragraph lists several positive traits that Mattie has, with the most emphasis being placed on her openness to the world around her (see explanation for choice C).

4

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 1-7 (“Mattie . . . farm”)
- B) Lines 7-13 (“He had . . . anyhow”)
- C) Lines 13-16 (“But it . . . hearth”)
- D) Lines 17-21 (“She had . . . will”)

Estimated Difficulty: Easy

Key: D

Choice D is the best answer. Lines 17-21 explain that Mattie “had an eye to see and an ear to hear: [Ethan] could show her things and tell her things, and taste the bliss of feeling that all he imparted left long reverberations and echoes he could wake at will.” In other words, Mattie is open, or receptive, to ideas and experiences. Therefore, these lines serve as the best evidence for the answer to the previous question.

Choice A is incorrect because lines 1-7 only describe Ethan and Mattie’s living situation and indicate that Ethan enjoys walking with her in the evenings. They do not indicate which quality

of Mattie’s Ethan values the most. Therefore, these lines do not serve as the best evidence for the answer to the previous question.

Choice B is incorrect because lines 7-13 only indicate Ethan’s first impression of Mattie. Mattie comes across as generally friendly and enthusiastic in their first encounter, but it is not these qualities that Ethan values the most. Therefore, these lines do not serve as the best evidence for the answer to the previous question.

Choice C is incorrect because lines 13-16 only convey that there was something special about Mattie beyond her friendliness and enthusiasm. They do not indicate what Ethan values the most about Mattie. Therefore, these lines do not serve as the best evidence for the answer to the previous question.

Questions 5-9 are based on the following passage and supplementary material.

This passage is adapted from Ed Yong, “Turtles Use the Earth’s Magnetic Field as Global GPS.” ©2011 by Kalmbach Publishing Co.

In 1996, a loggerhead turtle called Adelita swam across 9,000 miles from Mexico to Japan, crossing the entire Pacific on her way. Wallace J. Nichols tracked this epic journey with a satellite tag. But Adelita herself had no such technology at her disposal. How did she steer a route across two oceans to find her destination?

Nathan Putman has the answer. By testing hatchling turtles in a special tank, he has found that they can use the Earth’s magnetic field as their own Global Positioning System (GPS). By sensing the field, they can work out both their latitude and longitude and head in the right direction.

Putman works in the lab of Ken Lohmann, who has been studying the magnetic abilities of loggerheads for over 20 years. In his lab at the University of North Carolina, Lohmann places hatchlings in a large water tank surrounded by a large grid of electromagnetic coils. In 1991, he found that the babies started swimming in the opposite direction if he used the coils to reverse the direction of the magnetic field around them. They could use the field as a compass to get their bearing.

Later, Lohmann showed that they can also use the magnetic field to work out their position. For them, this is literally a matter of life or death. Hatchlings born off the sea coast of Florida spend their early lives in the North Atlantic gyre, a warm current that circles between North America and Africa. If they’re swept towards the cold waters outside the gyre, they die. Their magnetic sense keeps them safe.

Using his coil-surrounded tank, Lohmann could mimic the magnetic field at different parts of the

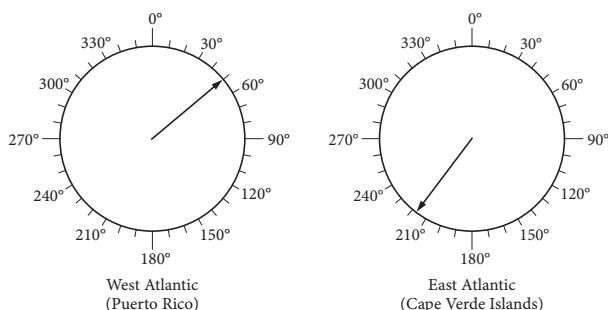
Earth's surface. If he simulated the field at the northern edge of the gyre, the hatchlings swam southwards. If he simulated the field at the gyre's southern edge, the turtles swam west-northwest. These experiments showed that the turtles can use their magnetic sense to work out their latitude—their position on a north-south axis. Now, Putman has shown that they can also determine their longitude—their position on an east-west axis.

He tweaked his magnetic tanks to simulate the fields in two positions with the same latitude at opposite ends of the Atlantic. If the field simulated the west Atlantic near Puerto Rico, the turtles swam northeast. If the field matched that on the east Atlantic near the Cape Verde Islands, the turtles swam southwest. In the wild, both headings would keep them within the safe, warm embrace of the North Atlantic gyre.

Before now, we knew that several animal migrants, from loggerheads to reed warblers to sparrows, had some way of working out longitude, but no one knew how. By keeping the turtles in the same conditions, with only the magnetic fields around them changing, Putman clearly showed that they can use these fields to find their way. In the wild, they might well also use other landmarks like the position of the sea, sun and stars.

Putman thinks that the turtles work out their position using two features of the Earth's magnetic field that change over its surface. They can sense the field's inclination, or the angle at which it dips towards the surface. At the poles, this angle is roughly 90 degrees and at the equator, it's roughly zero degrees. They can also sense its intensity, which is strongest near the poles and weakest near the Equator. Different parts of the world have unique combinations of these two variables. Neither corresponds directly to either latitude or longitude, but together, they provide a "magnetic signature" that tells the turtle where it is.

Orientation of Hatchling Loggerheads Tested in Magnetic Fields



Adapted from Nathan Putman, Courtney Endres, Catherine Lohmann, and Kenneth Lohmann, "Longitude Perception and Bicoordinate Magnetic Maps in Sea Turtles." ©2011 by Elsevier Inc.

Orientation of hatchling loggerheads tested in a magnetic field that simulates a position at the west side of the Atlantic near Puerto Rico (left) and a position at the east side of the Atlantic near the Cape Verde Islands (right). The arrow in each circle indicates the mean direction that the group of hatchlings swam. Data are plotted relative to geographic north ($N = 0^\circ$).

5

The passage most strongly suggests that Adelita used which of the following to navigate her 9,000-mile journey?

- A) The current of the North Atlantic gyre
- B) Cues from electromagnetic coils designed by Putman and Lohmann
- C) The inclination and intensity of Earth's magnetic field
- D) A simulated "magnetic signature" configured by Lohmann

Estimated Difficulty: Easy

Key: C

Choice C is the best answer. The first paragraph describes the 9,000-mile journey that Adelita made and raises the question, which the rest of the passage tries to answer, of how this loggerhead turtle was able to "steer a route across two oceans to find her destination" (lines 6-7). The answer comes most directly in the last paragraph, which presents Putman's belief that loggerhead turtles "work out their position using two features of the Earth's magnetic field that change over its surface" (lines 61-63): its inclination and its intensity. It is reasonable, therefore, to infer from the passage that this was the method that Adelita used.

Choice A is incorrect because there is no evidence in the passage that Adelita used the current of the North Atlantic gyre to navigate her 9,000-mile journey. The passage does discuss the North Atlantic gyre but only as the place where loggerhead turtle hatchlings "born off the sea coast of Florida spend their early lives" (lines 27-28).

Choice B is incorrect because there is no evidence in the passage that Adelita navigated her 9,000-mile journey with the aid of cues from electromagnetic coils designed by Putman and Lohmann. The passage does say that Putman and Lohmann use electromagnetic coils as part of their research on loggerhead turtles, but the coils are part of tanks used in a laboratory to study loggerhead hatchlings (see lines 16-19).

Choice D is incorrect because there is no evidence in the passage that Adelita navigated her 9,000-mile journey with the aid of a simulated "magnetic signature" configured by Lohmann. The passage does describe how Lohmann and Putman manipulate magnetic fields as part of

their research on loggerhead turtle hatchlings (see, for example, lines 16-23), but there is no indication that the two scientists used (or even could use) the kind of equipment necessary for this project outside of laboratory tanks or with Adelita in the wild.

6

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 1-3 (“In 1996 . . . way”)
- B) Lines 32-34 (“Using . . . surface”)
- C) Lines 58-60 (“In the wild . . . stars”)
- D) Lines 70-73 (“Neither . . . it is”)

Estimated Difficulty: Medium	Key: D
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Choice D is the best answer because in lines 70-73 the author indicates that “together, [inclination and intensity] provide a ‘magnetic signature’ that tells the turtle where it is.” Therefore, these lines serve as the best evidence for the answer to the previous question.

Choice A is incorrect because in lines 1-3 the author establishes that Adelita made a 9,000-mile journey but does not explain how she navigated it. These lines, thus, do not serve as the best evidence for the answer to the previous question.

Choice B is incorrect because in lines 32-34 the author indicates that Lohmann is able to “mimic the magnetic field at different parts of the Earth’s surface” in his laboratory but does not explain how Adelita navigated her 9,000-mile journey or suggest that Lohmann had any influence over Adelita’s trip. Therefore, these lines do not serve as the best evidence for the answer to the previous question.

Choice C is incorrect because in lines 58-60 the author notes that loggerhead turtles “in the wild” may make use of “landmarks like the position of the sea, sun and stars” but does not indicate that Adelita used such landmarks to navigate her 9,000-mile journey. Therefore, these lines do not serve as the best evidence for the answer to the previous question.

7

As used in line 3, “tracked” most nearly means

- A) searched for.
- B) traveled over.
- C) followed.
- D) hunted.

Estimated Difficulty: Easy	Key: C
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Choice C is the best answer because the context makes clear that Nichols followed Adelita’s “epic journey with a satellite tag” (line 4).

Choice A is incorrect because while “tracked” sometimes means “searched for,” it would make little sense in context to say that Nichols searched for Adelita’s “epic journey with a satellite tag” (line 4). It is more reasonable to conclude from the passage that Nichols knew about Adelita and her journey and used a satellite tag to help follow it.

Choice B is incorrect because while “tracked” sometimes means “traveled over,” it would make no sense in context to say that Nichols traveled over Adelita’s “epic journey with a satellite tag” (line 4).

Choice D is incorrect because while “tracked” sometimes means “hunted,” it would make no sense in context to say that Nichols hunted Adelita’s “epic journey with a satellite tag” (line 4).

8

The author refers to reed warblers and sparrows (line 53) primarily to

- A) contrast the loggerhead turtle’s migration patterns with those of other species.
- B) provide examples of species that share one of the loggerhead turtle’s abilities.
- C) suggest that most animal species possess some ability to navigate long distances.
- D) illustrate some ways in which the ability to navigate long distances can help a species.

Estimated Difficulty: Easy	Key: B
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Choice B is the best answer because the author indicates that reed warblers and sparrows, like loggerhead turtles, had previously been known to have “some way of working out longitude” (line 54).

Choice A is incorrect because, although the author notes that loggerhead turtles, reed warblers, and sparrows are all “animal migrants” (line 52), he offers no specifics about the migration patterns of reed warblers and sparrows, and the only connection he draws among the three animals is their recognized ability of somehow “working out longitude” (line 54).

Choice C is incorrect because the author only mentions three “animal migrants” by name (loggerhead turtles, reed warblers, and sparrows) and indicates that “several” such migrants had previously been known to have “some way of

working out longitude” (line 54). He makes no claim in the passage that most animal species have some long-distance navigation ability.

Choice D is incorrect because although the author indicates that reed warblers and sparrows, like loggerhead turtles, are “animal migrants” (line 52), he offers no specifics about how the ability to navigate long distances might help reed warblers and sparrows (nor, for that matter, much information about how this ability might help loggerhead turtles).

9

It can reasonably be inferred from the passage and graphic that if scientists adjusted the coils to reverse the magnetic field simulating that in the East Atlantic (Cape Verde Islands), the hatchlings would most likely swim in which direction?

- A) Northwest
- B) Northeast
- C) Southeast
- D) Southwest

Estimated Difficulty: Hard

Key: B

Choice B is the best answer. The passage notes that Lohmann, who studied loggerhead turtle hatchlings “in a large water tank surrounded by a large grid of electromagnetic coils” (lines 17-19) capable of manipulating the magnetic field around the turtles, discovered that the hatchlings would start “swimming in the opposite direction” when he “reverse[d] the direction of the magnetic field around them” (lines 20-22). The graphic (whose caption establishes that geographic north is represented by 0 degrees) indicates that loggerhead hatchlings tested in a magnetic field that simulates a position at the east side of the Atlantic near the Cape Verde Islands would normally travel in a southwesterly direction (around 218 degrees). Given the above information, it is reasonable to infer that if the magnetic field were reversed, the turtles would travel in a northeasterly direction.

Choice A is incorrect because information in the passage and graphic suggests that the loggerhead turtle hatchlings would travel in a northeasterly, and not a northwesterly, direction if scientists reversed the magnetic field simulating a position at the east side of the Atlantic near the Cape Verde Islands.

Choice C is incorrect because information in the passage and graphic suggests that the loggerhead turtle hatchlings would travel in a

northeasterly, and not a southeasterly, direction if scientists reversed the magnetic field simulating a position at the east side of the Atlantic near the Cape Verde Islands.

Choice D is incorrect because information in the passage and graphic suggests that the loggerhead turtle hatchlings would travel in a northeasterly, and not a southwesterly, direction if scientists reversed the magnetic field simulating a position at the east side of the Atlantic near the Cape Verde Islands. The graphic indicates that the hatchlings travel southwesterly under the normal (nonreversed) simulated conditions.

Writing and Language Test Overview

In the Writing and Language Test, you will be asked to make revising and editing decisions to improve the text within a passage.

- » **Total questions:** 44 passage-based revising and editing questions with multiple-choice responses
- » **Time allotted:** 35 minutes
- » Calculators may not be used or be on your desk.

Tips for the Writing and Language Test

- » The test is comprised of a series of passages and associated multiple-choice questions that put you in the role of someone revising or editing the work of an unspecified writer. You are revising the texts for development, organization, and effective language use as well as editing the texts to ensure that they follow the conventions of Standard Written English grammar, usage, and punctuation.
- » Rote memorization of language rules is not tested, nor are any questions based on short snippets of text taken out of context. The best answer to each question represents how a writer should develop, organize, and use language in a multiparagraph passage. We want to see whether you can make context-based improvements to the text.
- » The most common format for the questions offers three alternatives to an underlined portion of the text along with the option of not changing the language as presented. Remember to answer these questions in the context of the whole passage.

About the Passages

The passages range in length from about 400 to 450 words, and they are well-written pieces covering topics related to careers, history/social studies, the

humanities, and science. As in the Reading Test, some passages are accompanied by informational graphics such as tables, graphs, and charts; some questions require you to revise or edit a passage in light of the information and ideas conveyed graphically. (Again, mathematical computation is not required to answer these questions.)

DIRECTIONS

Each passage below is accompanied by a number of questions. For some questions, you will consider how the passage might be revised to improve the expression of ideas. For other questions, you will consider how the passage might be edited to correct errors in sentence structure, usage, or punctuation. A passage or a question may be accompanied by one or more graphics (such as a table or graph) that you will consider as you make revising and editing decisions.

Some questions will direct you to an underlined portion of a passage. Other questions will direct you to a location in a passage or ask you to think about the passage as a whole.

After reading each passage, choose the answer to each question that most effectively improves the quality of writing in the passage or that makes the passage conform to the conventions of standard written English. Many questions include a “NO CHANGE” option. Choose that option if you think the best choice is to leave the relevant portion of the passage as it is.

Questions 1-5 are based on the following passage.

Dong Kingman: Painter of Cities

A 1954 documentary about renowned watercolor painter Dong Kingman shows the artist sitting on a stool on Mott Street in New York City’s Chinatown. A crowd of admiring spectators watches as Kingman squeezes dollops of paint from several tubes into a tin watercolor box. From just a few primary colors, Kingman creates dozens of beautiful hues as he layers the translucent paint onto the paper on his easel. Each stroke of the brush and dab of the sponge transforms thinly sketched outlines into buildings, shop signs,

and streetlamps. The street scene Kingman begins composing in this short film is very much in keeping with the urban landscapes for which he is best known.

[1] Kingman was keenly interested in landscape painting from an early age. [2] In Hong Kong, where Kingman completed his schooling, teachers at that time customarily assigned students a formal “school name.” [3] His interest was so keen, in fact, that he was named after it. [4] The young boy who had been Dong Moy Shu became Dong Kingman. [5] The name Kingman was selected for its two parts: “king” and “man,” Cantonese for “scenery” and “composition.” [6] As Kingman developed as a painter, his works were often compared to

1 paintings by Chinese landscape artists dating back to CE 960, a time when a strong tradition of landscape painting emerged in Chinese art.

[7] Kingman, however, **2** vacated from that tradition in a number of ways, most notably in that he chose to focus not on natural landscapes, such as mountains and rivers, but on cities. **3**

In his urban landscapes, Kingman captures the vibrancy of crowded cities. His fine brushwork conveys detailed street-level activity: a peanut vendor pushing his cart on the sidewalk, a pigeon pecking for crumbs around a fire **4** hydrant, an old man tending to a baby outside a doorway. His broader brush strokes and sponge-painted shapes create majestic city skylines, with skyscrapers towering in the background, bridges connecting neighborhoods on either side of a river, and enormous ships docking at busy urban ports. To art critics and fans alike, these city scenes represent the innovative spirit of

twentieth-century urban Modernism.

During his career, Kingman exhibited his work **5** internationally. He garnered much acclaim. In 1936, a critic described one of Kingman's solo exhibits as "twenty of the freshest, most satisfying watercolors that have been seen hereabouts in many a day." Since Kingman's death in 2000, museums across the United States and in China have continued to ensure that his now-iconic landscapes remain available for the public to enjoy.

1

- A) NO CHANGE
- B) Chinese landscape artists
- C) painters of Chinese landscapes
- D) artists

Estimated Difficulty: Medium

Key: A

Choice A is the best answer because it creates a comparison between like terms: "works" by Kingman and "paintings by Chinese landscape artists."

Choice B is incorrect because it creates a comparison between unlike terms: "works" by Kingman and "Chinese landscape artists."

Choice C is incorrect because it creates a comparison between unlike terms: "works" by Kingman and "painters of Chinese landscapes."

Choice D is incorrect because it creates a comparison between unlike terms: "works" by Kingman and "artists."

2

- A) NO CHANGE
- B) evacuated
- C) departed
- D) retired

Estimated Difficulty: Hard

Key: C

Choice C is the best answer because "departed" is the most contextually appropriate way to indicate that Kingman had deviated from the tradition of Chinese landscape painting in a number of ways.

Choice A is incorrect because, while "vacated" does offer some sense of "leaving," it would be awkward and unconventional to say that a person was vacating from a tradition in a number of ways.

Choice B is incorrect because, while "evacuated" does offer some sense of "leaving," it would be awkward and unconventional to say that a person was evacuating from a tradition in a number of ways.

Choice D is incorrect because, while "retired" does offer some sense of "leaving," it would be awkward and unconventional to say that a person was retiring from a tradition in a number of ways.

3

To make this paragraph most logical, sentence 3 should be placed

- A) where it is now.
- B) before sentence 1.
- C) after sentence 1.
- D) after sentence 4.

Estimated Difficulty: Easy

Key: C

Choice C is the best answer because placing sentence 3 after sentence 1 makes the paragraph most cohesive. Sentence 3 refers to Kingman's "interest" being "so keen," a continuation of the idea in sentence 1, which says that "Kingman was keenly interested in landscape painting from an early age."

Choice A is incorrect because leaving sentence 3 where it is now creates a sequence of sentences that lacks sufficient cohesion. Keeping sentence 3 in its current location disrupts the link between sentence 2 (which describes the concept of "school names" in Hong Kong) and sentence 4 (which reveals that Dong Kingman was the school name of Dong Moy Shu).

Choice B is incorrect because placing sentence 3 before sentence 1 creates a sequence of sentences that lacks sufficient cohesion. Putting sentence 3 at the beginning of the paragraph would offer a poor introduction to the paragraph, in large part because sentence 3 builds directly on a point made in sentence 1.

Choice D is incorrect because placing sentence 3 after sentence 4 creates a sequence of sentences that lacks sufficient cohesion. Putting sentence 3 after sentence 4 would disrupt the link between sentence 4 (which mentions that Dong Moy Shu was given the school name Dong Kingman) and sentence 5 (which explains what the two parts comprising the name Kingman mean in Cantonese).

- A) NO CHANGE
 B) hydrant—
 C) hydrant:
 D) hydrant

Estimated Difficulty: Easy

Key: A

Choice A is the best answer because a comma after the word “hydrant” separates the phrase “a pigeon pecking for crumbs around a fire hydrant” from the phrase “an old man tending to a baby outside a doorway.” A comma is also consistent with the punctuation choice made to separate the first two phrases in the series following the colon in the sentence.

Choice B is incorrect because a dash is not a conventional choice for punctuating items in a series.

Choice C is incorrect because although a colon can be used to introduce a series, it is not a conventional choice for separating items within a series.

Choice D is incorrect because it fuses together two items in the series. Separating the phrases “a pigeon pecking for crumbs around a fire hydrant” and “an old man tending to a baby outside a doorway” requires punctuation and/or a coordinating conjunction.

Which choice most effectively combines the sentences at the underlined portion?

- A) internationally, and Kingman also garnered
 B) internationally; from exhibiting, he garnered
 C) internationally but garnered
 D) internationally, garnering

Estimated Difficulty: Medium

Key: D

Choice D is the best answer because it combines the sentences logically and efficiently, with the original second sentence becoming a participial phrase describing Kingman.

Choice A is incorrect because it creates a wordy and awkward construction and because it fails to link the acclaim Kingman received with the exhibition of his work.

Choice B is incorrect because it creates a repetitive and awkward construction.

Choice C is incorrect because “but” suggests contrast or exception, neither of which makes sense in the context of the sentence.

Questions 6-12 are based on the following passage and supplementary material.

A Life in Traffic

A subway system is expanded to provide service to a growing suburb. A bike-sharing program is adopted to encourage nonmotorized transportation.

6 To alleviate rush hour traffic jams in a congested downtown area, stoplight timing is coordinated. When any one of these changes occurs, it is likely the result of careful analysis conducted by transportation planners.

The work of transportation planners generally includes evaluating current transportation needs, assessing the effectiveness of existing facilities, and improving those facilities or **7** they design new ones. Most transportation planners work in or near cities, but some are employed in rural areas. Say, for example, a large factory is built on the outskirts of a small town. Traffic to and from that location would increase at the beginning and end of work shifts. The transportation **8** planner’s job, might involve conducting a traffic count to determine the daily number of vehicles traveling on the road to the new factory. If analysis of the traffic count indicates that there is more traffic than the current design of the road can efficiently accommodate, the transportation planner might recommend widening the road to add another lane.

Transportation planners work closely with a number of community stakeholders, such as government officials and other interested organizations and individuals. **9** Next, representatives from the local public health department might provide input in designing a network of trails and sidewalks to encourage people to walk more. **10** According to the American Heart Association, walking provides

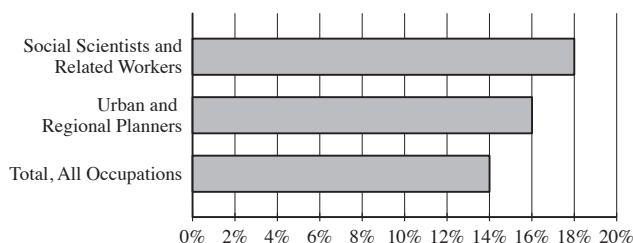
numerous benefits related to health and well-being.

Members of the Chamber of Commerce might share suggestions about designing transportation and parking facilities to support local businesses.

11 People who pursue careers in transportation planning have a wide variety of educational backgrounds. A two-year degree in transportation technology may be sufficient for some entry-level jobs in the field. Most jobs, however, require at least a bachelor's degree; majors of transportation planners are varied, including fields such as urban studies, civil engineering, geography, or transportation and logistics management. For many positions in the field, a master's degree is required.

Transportation planners perform critical work within the broader field of urban and regional planning. As of 2010, there were approximately 40,300 urban and regional planners employed in the United States. The United States Bureau of Labor Statistics forecasts steady job growth in this field, **12** projecting that 16 percent of new jobs in all occupations will be related to urban and regional planning. Population growth and concerns about environmental sustainability are expected to spur the need for transportation planning professionals.

Urban and Regional Planners
Percent Increase in Employment, Projected 2010–2020



Adapted from *United States Bureau of Labor Statistics, Employment Projections Program*. "All occupations" includes all occupations in the United States economy.

6

Which choice best maintains the sentence pattern already established in the paragraph?

- A) NO CHANGE
- B) Coordinating stoplight timing can help alleviate rush hour traffic jams in a congested downtown area.
- C) Stoplight timing is coordinated to alleviate rush hour traffic jams in a congested downtown area.
- D) In a congested downtown area, stoplight timing is coordinated to alleviate rush hour traffic jams.

Estimated Difficulty: Medium

Key: C

Choice C is the best answer because it most closely maintains the sentence pattern established by the two preceding sentences, which begin with a noun and passive verb phrase ("A subway system is expanded," "A bike-sharing program is adopted").

Choice A is incorrect because it does not maintain the sentence pattern established by the two preceding sentences. Instead, it begins the sentence with an infinitive phrase.

Choice B is incorrect because it does not maintain the sentence pattern established by the two preceding sentences. Rather, it begins the sentence with a gerund.

Choice D is incorrect because it does not maintain the sentence pattern established by the two preceding sentences. Rather, it shifts the placement of a modifying prepositional phrase, "in a congested downtown area," from the end of the sentence to the beginning of the sentence.

7

- A) NO CHANGE
- B) to design
- C) designing
- D) design

Estimated Difficulty: Easy

Key: C

Choice C is the best answer because "designing" maintains parallelism with "evaluating," "assessing," and "improving."

Choice A is incorrect because "they design" does not maintain parallelism with "evaluating," "assessing," and "improving."

Choice B is incorrect because "to design" does not maintain parallelism with "evaluating," "assessing," and "improving."

Choice D is incorrect because “design” does not maintain parallelism with “evaluating,” “assessing,” and “improving.”

8

- A) NO CHANGE
- B) planner’s job
- C) planners job,
- D) planners job

Estimated Difficulty: Easy

Key: B

Choice B is the best answer because it correctly uses an apostrophe to indicate the possessive and doesn’t introduce any unnecessary punctuation.

Choice A is incorrect because, while it correctly indicates the possessive relationship between “transportation planner” and “job,” it introduces an unnecessary comma after the word “job.”

Choice C is incorrect because it doesn’t indicate the possessive relationship between “transportation planner” and “job,” and it introduces an unnecessary comma after the word “job.”

Choice D is incorrect because it doesn’t indicate the possessive relationship between “transportation planner” and “job.”

9

- A) NO CHANGE
- B) For instance,
- C) Furthermore,
- D) Similarly,

Estimated Difficulty: Medium

Key: B

Choice B is the best answer because the transitional phrase “For instance” logically indicates that what follows provides an example related to the previous sentence. “Representatives from the local public health department” is an example of the kinds of people with whom transportation planners work.

Choice A is incorrect because the transitional word “Next” indicates sequence, which is not logical given that what follows provides an example related to the previous sentence.

Choice C is incorrect because the transitional word “Furthermore” indicates addition, which is not logical given that what follows provides an example related to the previous sentence.

Choice D is incorrect because the transitional word “Similarly” indicates comparison or likeness, which is not logical given that what follows provides an example related to the previous sentence.

10

The writer is considering deleting the underlined sentence. Should the sentence be kept or deleted?

- A) Kept, because it provides supporting evidence about the benefits of walking.
- B) Kept, because it provides an additional example of a community stakeholder with whom transportation planners work.
- C) Deleted, because it blurs the paragraph’s focus on the community stakeholders with whom transportation planners work.
- D) Deleted, because it doesn’t provide specific examples of what the numerous benefits of walking are.

Estimated Difficulty: Medium

Key: C

Choice C is the best answer because it identifies the best reason the underlined sentence should not be kept. At this point in the passage and the paragraph, a general statement about the benefits of walking only serves to interrupt the discussion of the community stakeholders with whom transportation planners work.

Choice A is incorrect because the underlined sentence should not be kept. Although the sentence could theoretically provide supporting evidence about the benefits of walking, the passage has not made a claim that needs to be supported in this way, and including such a statement only serves to interrupt the discussion of the community stakeholders with whom transportation planners work.

Choice B is incorrect because the underlined sentence should not be kept. Although the American Heart Association could theoretically be an example of “other interested organizations” that transportation planners work with, the sentence does not suggest that this is the case. Instead, the association is merely the source for the general statement about the benefits of walking, a statement that only serves to interrupt the discussion of the actual community stakeholders with whom transportation planners work.

Choice D is incorrect because, although the underlined sentence should be deleted, it is not because the sentence lacks specific examples of the numerous benefits of walking. Adding such

examples would only serve to blur the focus of the paragraph further with general factual information, as the paragraph's main purpose is to discuss the community stakeholders with whom transportation planners work.

11

- A) NO CHANGE
- B) People, who pursue careers in transportation planning,
- C) People who pursue careers, in transportation planning,
- D) People who pursue careers in transportation planning,

Estimated Difficulty: Easy

Key: A

Choice A is the best answer because “who pursue careers in transportation planning” is, in context, a restrictive clause that should not be set off with punctuation. “Who pursue careers in transportation planning” is essential information defining who the “people” are.

Choice B is incorrect because it incorrectly sets off the restrictive clause “who pursue careers in transportation planning” with commas as though the clause were nonrestrictive or not essential to defining who the “people” are.

Choice C is incorrect because it incorrectly sets off the essential sentence element “in transportation planning” with commas as though the phrase were not essential to the meaning of the sentence. “In transportation planning” is essential information defining what the “careers” are.

Choice D is incorrect because it introduces an unnecessary comma after the word “planning,” incorrectly setting off the subject of the sentence (“people who pursue careers in transportation planning”) from the predicate (“have a wide variety of educational backgrounds”).

12

Which choice completes the sentence with accurate data based on the graph?

- A) NO CHANGE
- B) warning, however, that job growth in urban and regional planning will slow to 14 percent by 2020.
- C) predicting that employment of urban and regional planners will increase 16 percent between 2010 and 2020.
- D) indicating that 14 to 18 percent of urban and regional planning positions will remain unfilled.

Estimated Difficulty: Hard

Key: C

Choice C is the best answer because it completes the sentence with an accurate interpretation of data in the graph. The graph displays projections of how much growth in employment there is expected to be between 2010 and 2020 for “social scientists and related workers,” for “urban and regional planners,” and in “all occupations” in the U.S. economy. According to the graph, the employment of urban and regional planners is expected to increase 16 percent between 2010 and 2020.

Choice A is incorrect because the data in the graph do not support the claim that 16 percent of new jobs in all occupations will be related to urban and regional planning.

Choice B is incorrect because the data in the graph do not support the claim that job growth in urban and regional planning will slow to 14 percent by 2020.

Choice D is incorrect because the data in the graph do not support the claim that 14 to 18 percent of urban and regional planning positions will remain unfilled.

Math

The Math questions test your ability to problem-solve and use appropriate approaches and tools strategically. It measures math skills across four areas:

- » Heart of Algebra
- » Problem Solving and Data Analysis
- » Passport to Advanced Math
- » Additional Topics in Math (covering relevant concepts learned in high school math, such as the Pythagorean theorem)

Math Test Overview

The Math test includes a portion that allows the use of a calculator and a portion that does not.

- » Total questions: 48
- » 40 multiple-choice questions
- » 8 student-produced response questions
- » Time allotted for Math – No Calculator: 25 minutes
- » Time allotted for Math – Calculator: 45 minutes

Some questions are like those you may have seen in your math courses. The ability to reason logically in a variety of situations, including ones related to career, science, and social studies, is tested throughout. You will also encounter at least three item sets that include more than one question about a given scenario.

Tips for the Math Test

- » Familiarize yourself with the directions ahead of time.
- » The test does not require you to memorize formulas. Commonly used formulas are provided in the test booklet at the beginning of each math portion. It is up to you to decide which formula is appropriate to a question.
- » Read the problem carefully. Look for key words that tell you what the problem is asking. Ask yourself the following questions before you solve each problem: What is the question asking? What do I know?
- » With some problems, it may be useful to draw a sketch or diagram of the given information.

- » Use the test booklet for scratch work. You are not expected to do all the reasoning and figuring in your head. You will not receive credit for anything written in the booklet, but you will be able to check your work easily later.
- » In the portion of the test that allows calculator use, decide when to use a calculator. (See Calculator Tips.)
- » Eliminate choices. If you don't know the correct answer to a question, try some of the choices. It's sometimes easier to find the wrong answers than the correct one. On some questions, you can eliminate all the incorrect choices. Remember that you won't lose points for incorrect answers, so plan to make your best guess if you don't know the answer.
- » Check your answer to make sure it is a reasonable answer to the question asked. This is especially true for student-produced response questions, where no answer choices are given.
- » All figures are drawn to scale unless otherwise indicated.

Calculator Policy

- » The no-calculator portion has 17 questions.
- » The calculator portion has 31 questions.
- » You will not be allowed to share calculators. You will be dismissed and your scores will be canceled if you use your calculator to share information during the test or to remove test questions or answers from the test room.

Calculator Tips

- » Remember to bring your calculator on test day. You should be familiar with how to use the calculator you bring to the test.
- » Make sure your calculator is in good working order and that its batteries are fresh. If your calculator fails during testing and you have no backup, you will have to complete the test without it (or cancel your scores for the entire test).
- » Don't buy an expensive, sophisticated calculator just to take the test. Although you can use them for the test, more sophisticated calculators are not required for any problem.
- » Don't try to use a calculator on every question. First, decide how you will solve the problem, and then decide whether to use the calculator. The calculator is meant to aid you in problem solving, not to get in the way.

- » Get your thoughts down before using your calculator. It may help to do scratch work in the test booklet.
- » Take the practice test with a calculator at hand for the portion of the test that allows calculator use. This will help you practice determining which types of questions you should use your calculator to answer.

Acceptable Calculators

Most questions on the Math – Calculator portion can be solved without a calculator, but you may find using a calculator helpful on some questions. A scientific or graphing calculator is recommended for the Math – Calculator portion.

Calculators permitted during testing are:

- » Most graphing calculators (see page 32)
- » All scientific calculators
- » Four-function calculators (not recommended)

If you bring a calculator with large characters (one-inch high or more) or raised display that might be visible to other test-takers, the test supervisor has discretion to seat you in a location where other test-takers cannot view the large or raised display.

Unacceptable Calculators

Do NOT bring these unacceptable calculators:

- » Laptops or other computers, tablets, cell phones, or smartphones
- » Models that can access the Internet, have wireless, Bluetooth, cellular, audio/video recording and playing, camera, or any other smartphone-type feature
- » Models that have typewriter-like keypad, pen-input, or stylus
- » Models that use electrical outlets, make noise, or have a paper tape (unless approved to use as an accommodation)

In addition, the use of hardware peripherals such as a stylus with an approved calculator is not permitted. Some models with touch-screen capability are not permitted (e.g., Casio ClassPad). Check the list of acceptable calculators for models that are permitted.

Sample Math Materials

Following are samples of the kinds of Math – No Calculator and Math – Calculator questions that may appear on your test. For these sample materials:

- » Review the notes and reference materials.
- » Decide on the best answer to each multiple-choice question.
- » Read the explanation for the best answer to each question, and for the multiple-choice questions, or the answer you chose (if they are different).

The notes and reference materials will appear at the beginning of both portions on the actual test. The explanation of the student-produced responses will appear in both portions of the actual test, but only once in these sample materials (page 27). The directions provided here match what you will see on the actual text.

Tips for Student-Produced Response Questions:

- » Review the directions on page 27 for gridding the student-produced response questions.
- » Know the rules for gridding mixed numbers and repeating decimals before taking the test.
- » Check your work if your answer does not fit on the grid. If you obtain a negative value or a value greater than 9999, you have made an error.
- » A zero cannot be gridded in the leftmost column of the answer grid. For example if your answer is 0.25, you must grid .25 or convert it to the fraction $\frac{1}{4}$.
- » A fraction does not have to be reduced unless it will not fit on the grid. For example, $\frac{6}{10}$ and $\frac{9}{15}$ are considered correct and do not have to be reduced to $\frac{3}{5}$.

Math Test – No Calculator

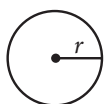
DIRECTIONS

For questions 1-4, solve each problem and choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions 5-6, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 5 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

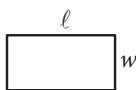
1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated,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

REFERENCE

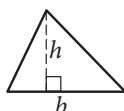


$$A = \pi r^2$$

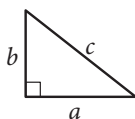
$$C = 2\pi r$$



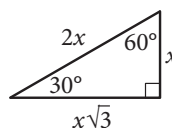
$$A = \ell w$$



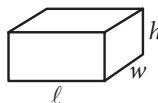
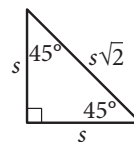
$$A = \frac{1}{2}bh$$



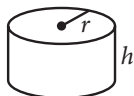
$$c^2 = a^2 + b^2$$



Special Right Triangles



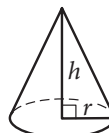
$$V = \ell wh$$



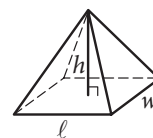
$$V = \pi r^2 h$$



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



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



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

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.

$$\frac{5(k+2)-7}{6} = \frac{13-(4-k)}{9}$$

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

- A) $\frac{9}{17}$
- B) $\frac{9}{13}$
- C) $\frac{33}{17}$
- D) $\frac{33}{13}$

Estimated Difficulty: Medium

Key: B

Choice B is correct. Simplifying the numerators yields $\frac{5k+3}{6} = \frac{9+k}{9}$, and cross-multiplication gives $45k+27 = 54+6k$. Solving for k yields $k = \frac{9}{13}$.

Choice A is not the correct answer. This value may result from not correctly applying the distributive property on the right-hand side, resulting in the expression $13-4-k$ in the numerator. Correctly applying the distributive property yields $13-(4-k) = 13-4+k$ in the numerator.

Choice C is not the correct answer. This value may result from not correctly applying the distributive property on the left-hand side, resulting in the expression $5k+2-7$. Correctly applying the distributive property yields $5(k+2)-7 = 5k+3$ in the numerator.

Choice D is not the correct answer. This value may result from not using the appropriate order of operations when simplifying either numerator.

$$4x - y = 3y + 7$$

$$x + 8y = 4$$

Based on the system of equations above, what is the value of the product xy ?

- A) $-\frac{3}{2}$
- B) $\frac{1}{4}$
- C) $\frac{1}{2}$
- D) $\frac{11}{9}$

Estimated Difficulty: Medium

Key: C

Choice C is correct. There are several solution methods possible, but all involve persevering in solving for the two variables and calculating the product. For example, combining like terms in the first equation yields $4x - 4y = 7$ and then multiplying that by 2 gives $8x - 8y = 14$. When this transformed equation is added to the second given equation, the y -terms are eliminated, leaving an equation in just one variable: $9x = 18$, or $x = 2$. Substituting 2 for x in the second equation (one could use either to solve) yields $2 + 8y = 4$, which gives $y = \frac{1}{4}$. Finally, the product xy is $2 \times \frac{1}{4} = \frac{1}{2}$.

Choice A is not the correct answer. Students who select this option have most likely made a calculation error in transforming the second equation (using $-4x - 8y = -16$ instead of $-4x - 32y = -16$) and used it to eliminate the x -terms.

Choice B is not the correct answer. This is the value of y for the solution of the system, but it has not been put back into the system to solve for x to determine the product xy .

Choice D is not the correct answer. Not understanding how to eliminate a variable when solving a system, a student may have added the equations $4x - 4y = 7$ and $x + 8y = 4$ to yield $5x + 4y = 11$. From here, a student may mistakenly simplify the left-hand side of this resulting equation to yield $9xy = 11$ and then proceed to use division by 9 on both sides in order to solve for xy .

$$\frac{1}{x} + \frac{2}{x} = \frac{1}{5}$$

Anise needs to complete a printing job using both of the printers in her office. One of the printers is twice as fast as the other, and together the printers can complete the job in 5 hours. The equation above represents the situation described. Which of the following describes what the expression $\frac{1}{x}$ represents in this equation?

- A) The time, in hours, that it takes the slower printer to complete the printing job alone
- B) The portion of the job that the slower printer would complete in one hour
- C) The portion of the job that the faster printer would complete in two hours
- D) The time, in hours, that it takes the slower printer to complete $\frac{1}{5}$ of the printing job

Estimated Difficulty: Hard

Key: B

Choice B is correct. From the description given, $\frac{1}{5}$ is the portion of the job that the two printers, working together, can complete in one hour, and each term in the sum on the left side is the part of this $\frac{1}{5}$ of the job that one of the printers contributes. Since one of the printers is twice as fast as the other, $\frac{2}{x}$ describes the portion of the job that the faster printer is able to complete in one hour and $\frac{1}{x}$ describes the portion of the job that the slower printer is able to complete in one hour.

Choice A is not the correct answer. The student may have not seen that in this context, the rates (that is, the work completed in a fixed time) of the printers can be added to get the combined rate, but the times it takes each printer to complete the job cannot be added to get the time for both printers working together, since the time for printers working together is less than, not greater than, the times for each printer alone. Hence the terms in the sum cannot refer to hours worked. In fact, the time it would take the slower printer to complete the whole job is x hours.

Choice C is not the correct answer. The student may have seen that $\frac{1}{x}$ is the smaller term in the sum, wrongly concluded that the smaller term must apply to the faster printer, and then assumed the 2 in the numerator of the second term implies the equation describes work completed in 2 hours. In fact, the

portion of the job that the faster printer could

complete in 2 hours is $(2)\left(\frac{2}{x}\right) = \frac{4}{x}$.

Choice D is not the correct answer. The student may have correctly seen that the value $\frac{1}{5}$ on the right side refers to the portion of the job completed, but not seen that in this context, the rates (that is, the work completed in a fixed time) of the printers can be added to get the combined rate, but the times it takes each printer to complete the job cannot be added to get the time for both printers working together. Hence the terms in the sum cannot refer to hours worked. In fact, the time it takes the slower printer to complete $\frac{1}{5}$ of the job is $\frac{x}{5}$ hours.

The graph of $y = (2x - 4)(x - 4)$ is a parabola in the xy -plane. In which of the following equivalent expressions do the x - and y -coordinates of the vertex of the parabola appear as constants or coefficients?

- A) $y = 2x^2 - 12x + 16$
- B) $y = 2x(x - 6) + 16$
- C) $y = 2(x - 3)^2 + (-2)$
- D) $y = (x - 2)(2x - 8)$

Estimated Difficulty: Medium

Key: C

Choice C is correct. The equation $y = (2x - 4)(x - 4)$ can be written in vertex form, $y = a(x - h)^2 + k$, to display the vertex, (h, k) , of the parabola. To put the equation in vertex form, first multiply: $(2x - 4)(x - 4) = 2x^2 - 8x - 4x + 16$. Then add like terms, $2x^2 - 8x - 4x + 16 = 2x^2 - 12x + 16$. The next step is completing the square.

$$y = 2x^2 - 12x + 16$$

$$y = 2(x^2 - 6x) + 16$$

Isolate the x^2 term by factoring

$$y = 2(x^2 - 6x + 9 - 9) + 16$$

Make a perfect square in the parentheses

$$y = 2(x^2 - 6x + 9) - 18 + 16$$

Move the extra term out of the parentheses

$$y = 2(x - 3)^2 - 18 + 16$$

Factor inside the parentheses

$$y = 2(x - 3)^2 - 2$$

Simplify the remaining terms

Therefore, the coordinates of the vertex, $(3, -2)$, are only both revealed in choice C. Since you are told that all of the equations are equivalent, simply knowing the form that displays the coordinates of the vertex will save all of these

steps — this is known as “seeing structure in the expression or equation.”

Choice A is incorrect; it displays the y -value of the y -intercept of the graph $(0, 16)$ as a constant.

Choice B is incorrect; it displays the y -value of the y -intercept of the graph $(0, 16)$ as a constant.

Choice D is incorrect; it displays the x -value of one of the x -intercepts of the graph $(2, 0)$ as a constant.

Student-Produced Response Math Questions

For some questions in the Math Test, you will be asked to solve the problem and enter your answer in the grid, as described below, on the answer sheet.

- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
- Mark no more than one circle in any column.
- No question has a negative answer.
- Some problems may have more than one correct answer. In such cases, grid only one answer.
- Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If $\begin{array}{|c|c|c|c|} \hline 3 & 1 & / & 2 \\ \hline \bullet & \bullet & \bullet & \bullet \\ \hline \end{array}$ is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)
- Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Answer: $\frac{7}{12}$

Write answer in boxes. →

7	/	1	2
•	•	•	•
0	0	0	0
1	1	1	1
2	2	2	•
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
•	7	7	7
8	8	8	8
9	9	9	9

Grid in result. ←

← Fraction line

Answer: 2.5

2	.	5
•	•	•
0	0	0
1	1	1
2	•	2
3	3	3
4	4	4
5	5	•
6	6	6
7	7	7
8	8	8
9	9	9

← Decimal point

Acceptable ways to grid $\frac{2}{3}$ are:

2	/	3
•	•	•
0	0	0
1	1	1
2	•	2
3	3	•
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9

.	6	6	6
•	•	•	•
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	•	•	•
7	7	7	7
8	8	8	8
9	9	9	9

.	6	6	7
•	•	•	•
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	•	•	•
7	7	7	•
8	8	8	8
9	9	9	9

Answer: 201 – either position is correct

2	0	1
•	•	•
0	•	0
1	1	•
2	•	2
3	3	3

2	0	1
•	•	•
•	•	0
1	1	•
2	•	2
3	3	3

NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

5

If $\frac{1}{2}x + \frac{1}{3}y = 4$, what is the value of $3x + 2y$?

Estimated Difficulty: Medium

Key: 24

Using the structure of the equation allows you to quickly solve the problem if you see that multiplying both sides of the equation by 6 clears the fractions and yields $3x + 2y = 24$.

6

$$x^2 + y^2 - 6x + 8y = 144$$

The equation of a circle in the xy -plane is shown above. What is the *diameter* of the circle?

Estimated Difficulty: Hard

Key: 26

Completing the square yields the equation $(x - 3)^2 + (y + 4)^2 = 169$, the standard form of an equation of the circle. Understanding this form results in the equation $r^2 = 169$, which when solved for r gives the value of the radius as 13. The diameter is twice the value of the radius; therefore, the diameter is 26.

Math Test – Calculator

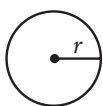
DIRECTIONS

For questions 1-5, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For question 6, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 6 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

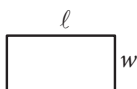
1. The use of a calculator **is permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

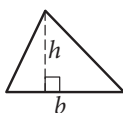


$$A = \pi r^2$$

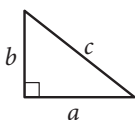
$$C = 2\pi r$$



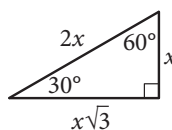
$$A = \ell w$$



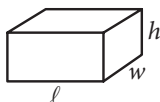
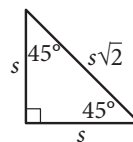
$$A = \frac{1}{2}bh$$



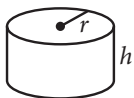
$$c^2 = a^2 + b^2$$



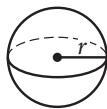
Special Right Triangles



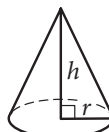
$$V = \ell wh$$



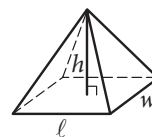
$$V = \pi r^2 h$$



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



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



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

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.

Aaron is staying at a hotel that charges \$99.95 per night plus tax for a room. A tax of 8% is applied to the room rate, and an additional onetime untaxed fee of \$5.00 is charged by the hotel. Which of the following represents Aaron's total charge, in dollars, for staying x nights?

- A) $(99.95 + 0.08x) + 5$
- B) $1.08(99.95x) + 5$
- C) $1.08(99.95x + 5)$
- D) $1.08(99.95 + 5)x$

Estimated Difficulty: Easy

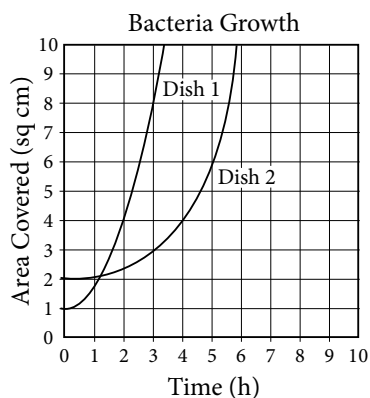
Key: B

Choice B is correct. The total charge that Aaron will pay is the room rate, the 8% tax on the room rate, and a fixed fee. If Aaron stayed x nights, then the total charge is $(99.95x + 0.08 \times 99.95x) + 5$, which can be rewritten as $1.08(99.95x) + 5$.

Choice A is not the correct answer. The expression includes only one night stay in the room and does not accurately account for tax on the room.

Choice C is not the correct answer. The expression includes tax on the fee, and the hotel does not charge tax on the \$5.00 fee.

Choice D is not the correct answer. The expression includes tax on the fee and a fee charge for each night.



A researcher places two colonies of bacteria into two petri dishes that each have an area of 10 square centimeters. After the initial placement of the bacteria ($t = 0$), the researcher measures and records the area covered by the bacteria in each dish every ten minutes. The data for each dish were fit

by a smooth curve, as shown in the graph, where each curve represents the area of a dish covered by bacteria as a function of time, in hours. Which of the following is a correct statement about the data above?

- A) At time $t = 0$, both dishes are 100% covered by bacteria.
- B) At time $t = 0$, bacteria covers 10% of Dish 1 and 20% of Dish 2.
- C) At time $t = 0$, Dish 2 is covered with 50% more bacteria than Dish 1.
- D) For the first hour, the area covered in Dish 2 is increasing at a higher average rate than the area covered in Dish 1.

Estimated Difficulty: Medium

Key: B

Choice B is the correct answer. Each petri dish has area 10 square centimeters, and so at time $t = 0$, Dish 1 is 10% covered ($\frac{1}{10}$) and Dish 2 is 20% covered ($\frac{2}{10}$). Thus the statement in B is true.

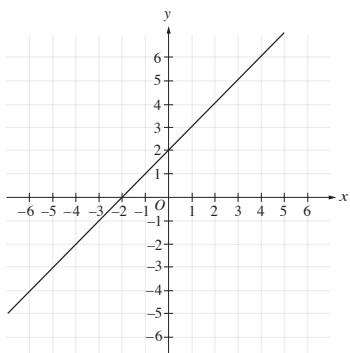
Choice A is not the correct answer. At the end of the observations, both dishes are 100% covered with bacteria, but at time $t = 0$, neither dish is 100% covered.

Choice C is not the correct answer. At time $t = 0$, Dish 1 is covered with 50% less bacteria than is Dish 2, but Dish 2 is covered with 100% more, not 50% more, bacteria than is Dish 1.

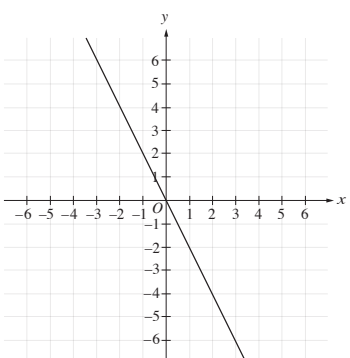
Choice D is not the correct answer. After the first hour, it is still true that more of Dish 2 is covered by bacteria than is Dish 1, but for the first hour the area of Dish 1 that is covered has been increasing at a higher average rate (about 0.8 sq cm/hour) than the area of Dish 2 (about 0.1 sq cm/hour).

If k is a positive constant different from 1, which of the following could be the graph of $y - x = k(x + y)$ in the xy -plane?

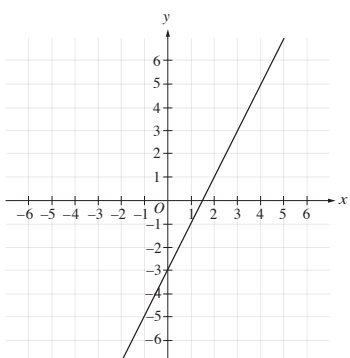
A)



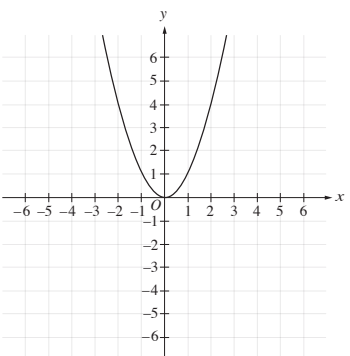
B)



C)



D)



Estimated Difficulty: Hard

Key: B

Choice B is correct. Manipulating the equation

to solve for y gives $y = \left(\frac{1+k}{1-k}\right)x$, revealing that the graph of the equation must be a line that passes through the origin. Of the choices given, only the graph shown in choice B satisfies these conditions.

Choice A is not the correct answer. If you selected this answer, you may have seen that the term $k(x + y)$ is a multiple of $x + y$ and wrongly concluded that this is the equation of a line with slope 1.

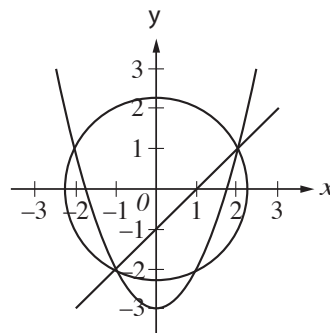
Choice C is not the correct answer. If you selected this answer, you may have made incorrect steps when simplifying the equation or may have not seen the advantage that putting the equation in slope-intercept form would give in determining the graph, and thus wrongly concluded the graph has a nonzero y -intercept.

Choice D is not the correct answer. If you selected this answer, you may not have seen that term $k(x + y)$ can be multiplied out and the variables x and y isolated, and wrongly concluded that the graph of the equation cannot be a line.

$$x^2 + y^2 = 5$$

$$y = x^2 - 3$$

$$x - y = 1$$



A system of three equations and their graphs in the xy -plane are shown above. How many solutions does the system have?

- A) One
- B) Two
- C) Three
- D) Four

Estimated Difficulty: Easy

Key: B

Choice B is correct. The solutions to the system of equations are the points where the circle, parabola, and line all intersect. These points are $(-1, 2)$ and $(2, 1)$, and these are the only solutions to the system.

Choice A is not the correct answer. This answer may reflect the misconception that a system of equations can have only one solution.

Choice C is not the correct answer. This answer may reflect the misconception that a system of equations has as many solutions as the number of equations in the system.

Choice D is not the correct answer. This answer may reflect the misconception that the solutions of the system are represented by the points where any two of the curves intersect, rather than the correct concept that the solutions are represented only by the points where all three curves intersect.

5

If the expression $\frac{4x^2}{2x-1}$ is written in the equivalent form $\frac{1}{2x-1} + A$, what is A in terms of x ?

- A) $2x + 1$
- B) $2x - 1$
- C) $4x^2$
- D) $4x^2 - 1$

Estimated Difficulty: Hard

Key: A

Choice A is correct. The form of the equation suggests performing long division on $\frac{4x^2}{2x-1}$:

$$\begin{array}{r} 2x+1 \\ 2x-1 \overline{) 4x^2} \\ \underline{4x^2 - 2x} \\ 2x \\ \underline{2x - 1} \\ 1 \end{array}$$

Since the remainder 1 matches the numerator in $\frac{1}{2x-1}$, it is clear that $A = 2x + 1$.

A short way to find the answer is to use the structure to rewrite the numerator of the expression as $(4x^2 - 1) + 1$, recognizing the term in parentheses as a difference of squares, making the expression equal to

$$\frac{(2x-1)(2x+1)+1}{2x-1} = 2x+1 + \frac{1}{2x-1}. \text{ From this, the}$$

answer $2x + 1$ is apparent. Another way to find the answer is to isolate A in the form

$$A = \frac{4x^2}{2x-1} - \frac{1}{2x-1} \text{ and simplify. As with the first}$$

approach, this approach also requires you to recognize $4x^2 - 1$ as a difference of squares that factors.

Choice B is not the correct answer. If you selected this answer, you may have made a sign error while subtracting partial quotients in the long division.

Choice C is not the correct answer. If you selected this answer, you may have misunderstood how to work with fractions and may have tried the incorrect calculation

$$\frac{4x^2}{2x-1} = \frac{(1)(4x^2)}{2x-1} = \frac{1}{2x-1} + 4x^2.$$

Choice D is not the correct answer. If you selected this answer, you may have misunderstood how to work with fractions and may have tried the incorrect calculation

$$\frac{4x^2}{2x-1} = \frac{1+4x^2-1}{2x-1} = \frac{1}{2x-1} + 4x^2 - 1.$$

Student-Produced Response Math Questions

For question 6, you are asked to solve the problem and enter your answer in the grid, as described on page 27 of this booklet.

6

The table below classifies the first 103 elements in the periodic table as metal, metalloid, or nonmetal and as solid, liquid, or gas at standard temperature and pressure.

	Solids	Liquids	Gases	Total
Metals	77	1	0	78
Metalloids	7	0	0	7
Nonmetals	6	1	11	18
Total	90	2	11	103

What fraction of all solids and liquids in the table are metalloids?

Estimated Difficulty: Easy

Key: .076, $\frac{7}{92}$

There are 7 metalloids that are solid or liquid, and there are 92 total solids and liquids. Therefore, the fraction of solids and liquids that are metalloids is $\frac{7}{92}$.

Acceptable Calculators

You should be familiar with the operation of your calculator and know when the calculator can be used effectively. All questions on the Math Test – Calculator can be solved without a calculator; however, using a calculator on some questions may be helpful to you.

On the Math Test – Calculator portion, all scientific calculators are permitted. A four-function calculator is acceptable but not recommended.

The following graphing calculators are permitted:

Approved Graphing Calculators

Casio FX-6000 series FX-6200 series FX-6300 series FX-6500 series FX-7000 series FX-7300 series FX-7400 series FX-7500 series FX-7700 series FX-7800 series FX-8000 series FX-8500 series FX-8700 series FX-8800 series FX-9700 series FX-9750 series FX-9860 series	CFX-9800 series CFX-9850 series CFX-9950 series CFX-9970 series FX 1.0 series Algebra FX 2.0 series FX-CG-10 (PRIZM) FX-CG-20	Hewlett-Packard HP-9G HP-28 series HP-38G HP-39 series HP-40 series HP-48 series HP-49 series HP-50 series HP Prime Radio Shack EC-4033 EC-4034 EC-4037	Sharp EL-5200 EL-9200 series EL-9300 series EL-9600 series* EL-9900 series *The use of the stylus is not permitted. Other Datexx DS-883 Micronta Smart ²	Texas Instruments TI-73 TI-80 TI-81 TI-82 TI-83 TI-83 Plus TI-83 Plus Silver TI-84 Plus TI-84 Plus CE TI-84 Plus Silver TI-84 Plus C Silver TI-85 TI-86 TI-89 TI-89 Titanium TI-Nspire TI-Nspire CX TI-Nspire CM-C TI-Nspire CAS TI-Nspire CX CAS TI-Nspire CM-C CAS TI-Nspire CX-C CAS
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