

# PERIOD 1: c. 1450 to c. 1648

**Chapter 1:** *The Renaissance and the Scientific Revolution*

**Chapter 2:** *Conflicts over Religious Pluralism*

**Chapter 3:** *Exploration and Encounters Overseas*

**Chapter 4:** *Tradition and Capitalism in Economic Life*

**Chapter 5:** *Tradition and Capitalism in Society*

**Chapter 6:** *Struggles over Sovereignty and Centralization*

## Period Overview

Between 1450 and 1648, Europeans began to change how they thought about the world. They were moving away from the beliefs of the Middle Ages about how to think and to organize society and creating the foundation for attitudes that people commonly share today.

**Science, Religion, and Exploration** This period saw the beginning of modern science. Instead of relying on long-held ideas about the natural world, people began to rely more on close observation and precise recording of information. The result was revolutionary. To start with, Europeans realized that the earth was not the center of the universe.

These years also witnessed the collapse of the one force that united Europeans: the leadership of the Roman Catholic Church. Reformers challenged Catholic teachings and power. One result was a century of religious warfare that cost millions of people their lives.

The mid-1400s were also the beginning of two centuries of European exploration outside the continent. Driven by dreams of wealth, desire to spread Christianity, and curiosity about the world, Europeans connected Europe, Africa, and Asia with North and South America for the first time. In doing so, they established colonies and trade relations that united the world as never before.

**Society and Politics** These changes laid the foundation for profound changes in society. In 1450, almost all Europeans lived in rural communities and survived on what they grew or made themselves. They accepted inequality as natural and were loyal to their king, regardless of whether he shared their culture. By 1648, the world of today, with large cities, equality, democracy, and strong government, was beginning to emerge.

## Key Concepts

- 1.1 The rediscovery of works from ancient Greece and Rome and observation of the natural world changed many Europeans' view of their world.
  - I. A revival of classical texts led to new methods of scholarship and new values in both society and religion.
  - II. The invention of printing promoted the dissemination of new ideas.
  - III. The visual arts incorporated the new ideas of the Renaissance and were used to promote personal, political, and religious goals.
  - IV. New ideas in science based on observation, experimentation, and mathematics challenged classical views of the cosmos, nature, and the human body, although existing traditions of knowledge and the universe continued.
- 1.2 Religious pluralism challenged the concept of a unified Europe.
  - I. The Protestant and Catholic reformations fundamentally changed theology, religious institutions, culture, and attitudes toward wealth and prosperity.
  - II. Religious reform both increased state control of religious institutions and provided justifications for challenging state authority.
  - III. Conflicts among religious groups overlapped with political and economic competition within and among states.
- 1.3 Europeans explored and settled overseas territories, encountering and interacting with indigenous populations.
  - I. European nations were driven by commercial and religious motives to explore overseas territories and establish colonies.
  - II. Advances in navigation, cartography, and military technology enabled Europeans to establish overseas colonies and empires.
  - III. Europeans established overseas empires and trade networks through coercion and negotiation.
  - IV. Europe's colonial expansion led to a global exchange of goods, flora, fauna, cultural practices, and diseases, resulting in the destruction of some indigenous civilizations, a shift toward European dominance, and the expansion of the slave trade.
- 1.4 European society and the experiences of everyday life were increasingly shaped by commercial and agricultural capitalism, notwithstanding the continued existence of medieval social and economic structures.
  - I. Economic change produced new social patterns, while traditions of hierarchy and status continued.
  - II. Most Europeans derived their livelihood from agriculture and oriented their lives around the seasons, the village, or the manor, although economic changes began to alter rural production and power.
  - III. Population shifts and growing commerce caused the expansion of cities, which often placed stress on their traditional political and social structures.

- IV. The family remained the primary social and economic institution of early modern Europe and took several forms, including the nuclear family.
- V. Popular culture, leisure activities, and rituals reflecting the continued popularity of folk ideas reinforced and sometimes challenged communal ties and norms.

**1.5** The struggle for sovereignty within and among states resulted in varying degrees of political centralization.

- I. The new concept of the sovereign state and secular systems of law played a central role in the creation of new political institutions.
- II. The competitive state system led to new patterns of diplomacy and new forms of warfare.
- III. The competition for power between monarchs and corporate and minority language groups produced different distributions of governmental authority in European states.

**Source:** AP® European History Course and Exam Description



Polish astronomer Nicolaus Copernicus ignited a revolution in European thought in the 16th century with his arguments that the sun, not the earth, was the center of the known universe. This statue of him stands in Warsaw, Poland.

**Credit:** Getty Images

# The Renaissance and the Scientific Revolution

*We have made you neither of heaven nor of Earth, neither mortal nor immortal, so that with freedom of choice and with honor, as though the maker and molder of yourself, you may fashion yourself in whatever shape you shall prefer.*

—Pico della Mirandola, from *On the Dignity of Man*

**Essential Question:** How did the worldview of European intellectuals shift in the 15th century?

**B**eginning in the mid-1300s, Europe entered a period of transition between the Middle Ages and the modern world. Since the 19th century, historians have called this period the **Renaissance**, from a French word meaning “rebirth.” During the Renaissance, many intellectuals showed a renewed interest in the civilizations of Greece and Rome during the **classical** era, roughly 800 B.C.E. to 500 C.E. Scholars of the 15th century first used the term **Middle Ages** to designate the period between the end of the classical era and their own time.

The Renaissance began in northern Italy and spread throughout Europe. It was a time when scholars broke free of the religion-based thinking of medieval times toward a belief in the dignity and limitless potential of human beings.

The **Roman Catholic Church** and the **Holy Roman Empire** had been the dominant institutions of the Middle Ages. Throughout that period, members of the clergy and issues of **theology**, the study of ideas about God, dominated intellectual life. The Catholic Church was closely involved in all aspects of political and social life. The Holy Roman Empire sought to establish unified political control over Christian Europe. Over time, scandals and abuses weakened the power of the papacy and the Catholic Church. The Holy Roman Emperors based in Germany found it increasingly difficult to maintain control over the distant Italian peninsula. These conditions, freeing scholars from the religious and political controls of the Middle Ages, set the stage for a period of intellectual exploration that had lasting effects throughout Europe on education, the arts, politics, religion, and science.

## Revived Interest in the Classical World

Throughout the Middle Ages, monks had preserved and studied many classical texts in monasteries throughout Europe. Yet during the Renaissance, the revived interest in classical texts took a new form. One major change was that many Renaissance scholars were not members of the clergy. In addition, they approached the texts in new ways.

### *Italian Renaissance Humanists*

Renaissance intellectuals who studied classical civilization and its texts were later called **humanists** because they focused on human beings and their inherent dignity. Humanists began to break free of the medieval philosophy known as **scholasticism**, which was limited by the beliefs of Roman Catholicism and focused on religious inquiries, such as proving the existence of God.

**A Shift in Ideas about Religion** Although humanists remained Christians, humanists tended to emphasize different values than did medieval scholars. The content of classical texts was **secular**, or worldly, rather than religious. Humanists emphasized living a good Earthly life rather than a life of penance aimed toward an afterlife. In addition, there was growth of **individualism** or a focus on personal rather than institutional interests.

**Petrarch** One of the earliest humanists, sometimes called the Father of Humanism, was an Italian poet and scholar named **Petrarch** (1304–1374). He saw the Middle Ages as a period of darkness when knowledge of classical civilization was in decline. (Later historians would refer to this period as the Dark Ages.) A lover of language, he criticized medieval scholars for their inelegant use of the Latin language and he searched for forgotten Latin manuscripts in libraries throughout Europe. One key discovery was *Letters to Atticus* by the Roman statesman and orator **Cicero** (106–43 B.C.E.), which gave insights into political life in classical Rome. Petrarch, followed by many later humanists, adopted Cicero as a model for writing in Latin. Though he appreciated Latin, he was among the first scholars of his era to write in the language of his region, Italian.

Stemming from his work with ancient manuscripts, Petrarch developed new **philological** approaches, scholarly methods of analyzing texts with a focus on the history of language. One famous use of philology occurred in 1440 when Lorenzo Valla demonstrated that an important Roman Catholic document, the *Donation of Constantine*, supposedly written by the Emperor Constantine in the 4th century, was a forgery, because its language was not the 4th-century Latin the emperor would have used.

Petrarch also admired Cicero's life as an engaged citizen. As a humanist, Petrarch focused on how people behaved. He criticized medieval thinkers who had focused more on scholarly issues of logic than on everyday concern of ethics.

## Challenges to Institutional Power

Many classical Greek texts in philosophy and science had nearly disappeared in Europe during the Middle Ages. However, Arabic-speaking Islamic scholars in the Middle East, North Africa, and Spain preserved these works. These scholars had translated the works into Arabic, and from Arabic into Latin. As Europeans came into increased contact with the Islamic world during the Crusades of the 12th century, the texts again became available in Europe. However, since books were still copied by hand at that time, access to them was limited.

Some Renaissance humanists began to study Greek so they could read classical texts in their original language. In addition, after the invention of the printing press around 1450, many more copies of books were available. With the spread of books and literacy, the influence of universities and the Catholic Church over intellectual life declined. Classical texts and new methods of scientific inquiry, rather than theological writings, became the focus of education.

**Changes in Education** Scholars in the 15th century expanded the revival of interest in Greek and Roman texts to include literature, drama, and history. These works had been unavailable or of little interest to medieval scholars who were primarily concerned with theological questions. During the 15th century, the **liberal arts** (areas of study required for general knowledge rather than for specific professional skills, such as becoming a lawyer or church official) of the Middle Ages began to be called the **humanities**, and humanists were known as teachers of the humanities. The chart shows that in spite of some similarity in medieval and Renaissance higher education, there was a different emphasis.

Liberal Arts Curriculum at European Universities	
Medieval Universities, c. 13th century	Renaissance Universities, c. 15th century
<ul style="list-style-type: none"><li>• Grammar</li><li>• Rhetoric</li><li>• Logic</li><li>• Arithmetic</li><li>• Geometry</li><li>• Astronomy</li><li>• Music</li></ul>	<ul style="list-style-type: none"><li>• History</li><li>• Moral philosophy</li><li>• Eloquence</li><li>• Letters (grammar and logic)</li><li>• Poetry</li><li>• Mathematics</li><li>• Astronomy</li><li>• Music</li></ul>
Instructors read aloud from Latin texts because few books were available.	Students were required to know Classical Latin and Greek to read those works directly.

Humanists believed that education could help people achieve their full human potential and would prepare them to be active, productive citizens. Therefore, they created secondary schools to teach the humanities to students at younger ages. In addition, while universities continued to focus on their traditional fields of study, they also began to include the humanities. The



ultimate goal for humanists was not the preparation of scholars in theology, law, or medicine, but the development of a **Renaissance man**, an individual who excelled in many areas.

**Challenges to the Catholic Church** As popes became more concerned with their political and financial power and with secular Renaissance culture, they lost some of the spiritual authority they once held. This shift happened at the same time many Christian humanists, especially in northern Europe, began to focus on texts of the early Catholic Church. These humanists advocated a return to a simpler and more humane form of Christianity. They criticized religious practices that they believed were not based on Scripture. (See Chapter 2 for more information on humanism and the Catholic Church.)

### ***Revival of Civic Humanist Culture***

In the 15th century, a single, unified country did not control the Italian peninsula. Instead, it was a collection of small regional kingdoms and self-governing communities called **city-states**. Large city-states, such as the northern Italian cities of **Florence, Venice, and Milan** also controlled the surrounding regions. Some of the city-states were ruled by local dukes and others by powerful families. Invasions by French, Spanish, and German forces only added to the political instability and rivalry among city-states.

**Greek and Roman Political Institutions** As humanists studied classical texts, they developed renewed admiration for Greek and Roman political institutions. For example, the city-state itself was the common form of government in classical Greece with Athens and Sparta as the two largest examples. Athens had been the site of the birth of **democracy**, government in which the people hold power either directly or by electing representatives. The **Roman Republic** was an early example of **representative government**, government elected by, and thus representative of, the people.

Politicians such as Cicero became secular models of active, engaged citizenship and eloquent leadership. Humanists saw in the classical examples a **civic humanist culture** that they sought to promote in their own place and time.

**Baldassare Castiglione** One secular model for individual behavior by the aristocratic class came from a writer in Milan. **Baldassare Castiglione** (1478–1529) wrote *The Book of the Courtier*, which outlined how to act as a proper gentleman or lady. It remained influential among the nobility for centuries. According to Castiglione, the ideal courtier, or person in frequent attendance at the court of a ruler, was similar to a medieval knight but was also classically educated, skilled in the arts, and engaged in civic life by serving that ruler.

**Niccolò Machiavelli** In 1498, **Niccolò Machiavelli** (1469–1527) began serving as a diplomat for the republic of Florence, thus also becoming familiar with French and German politics. While earlier generations of diplomats had represented the Christian empire, Machiavelli observed that Renaissance diplomats worked on behalf of their own state.

The early 16th century was a time of violence and instability in Florence. In 1512, a shift in political power caused the exile of Machiavelli and others who supported a republic. Hoping to demonstrate his insight and persuade another leader to hire him, Machiavelli turned to political writing.

Machiavelli's most famous work, *The Prince* (1513), provided advice for rulers. Unlike medieval political teachings that focused on morality, *The Prince* separated politics from morality. Perhaps written as a satire on contemporary Italian politics, *The Prince* stressed the need for an absolute ruler to use any means to achieve political unity and independence from foreign control. Machiavelli presented a cynical view of human nature that required the prince to be feared rather than loved. He emphasized the importance of maintaining the power of the state to provide citizens with peace and safety. To maintain stability, leaders often had to commit acts such as lying and bribery, Machiavelli explained, but should appear virtuous. A leader unwilling to act in such ways would fail to serve the community and would soon lose power.

In a later work, *The Discourses*, Machiavelli pointed to the Roman Republic as a model of a government under law, rather than under an authoritarian prince. Yet, whether Machiavelli himself favored republicanism or **despotism**, the exercise of oppressive and absolute power, his ideas were influential. The principles for achieving and maintaining power in *The Prince* became a guide for later authoritarian regimes. *The Prince* has become identified with the belief that “the end justify the means,” or that any methods, however evil or dishonest, may be used to achieve positive results.

## The Printing Press Revolution

One key feature of the Renaissance was access to written works. During the Middle Ages, books had been copied by hand. Printing from carved wooden blocks began in Europe toward the end of the 14th century. Such blocks were first used to print religious pictures and then small amounts of text. Renaissance scholars needed new technologies to make their ideas available beyond Italy.

**Invention of the Printing Press** A revolutionary printing technology—**movable type** made of metal—was developed by printers over the first half of the 15th century in Europe. With this new development, printers could compose whole pages of text by creating lines of type from individual letters. Once a page was printed, the printer could take the type apart and reuse it. **Johannes Gutenberg**, a German printer, devised a usable form of the new process between 1445 and 1450. In addition, Gutenberg developed a **printing press** that differed from earlier technology. The hand-operated wooden press was the beginning of a process of mechanizing printing and producing large quantities of books. The **Gutenberg Bible**, completed in 1456, is the first known example of a book produced from movable type.

Printing then spread rapidly throughout Europe, and within a few years there were printers throughout the Germanic states of the Holy Roman Empire.



By the 1470s, printing had spread throughout Europe. By 1500, Europe had more than 1,000 printers, and Venice alone had nearly 100. Most earlier printed works had been religious or classical and were often in Latin. However, the printing press made **vernacular literature**, written in the native language of a region, increasingly available. The availability of books in the language that ordinary people used increased the number of lay readers. Over the following centuries, reading caused people to identify more and more with their own national cultures.

**The Printing Press and Religious Reform** Renaissance humanism spread to northern Europe in the late 15th century, and northern humanists focused more on religious concerns than did their Italian counterparts. By 1500, about half of the 40,000 titles that had been published were Bibles or other religious works. Humanists especially desired to reform the Catholic Church; but such calls had spread slowly at first, because they were written in Latin and had to be copied by hand.

However, by 1517, printing had become well established and would have explosive impact on Europe. That year, German monk **Martin Luther** (1483–1546) called for religious reform. Luther emphasized the Bible as the main source of religious truth and believed that people should be able to read and interpret the Bible themselves without the aid of priests. Luther's ideas were quickly translated into German, printed into pamphlets, and distributed throughout German-speaking lands. A local protest by one unknown scholar ignited a raging controversy.

Soon, additional reformers added to the debate sparked by Luther. The printing press allowed them to spread their ideas faster and more widely than ideas had ever spread before.

Within a decade, a revolutionary shift in European Christianity and politics, known as the Protestant Reformation, had begun. (See Chapter 2 for more information on the Protestant Reformation.) Scripture readings became an important part of the Protestant services that were replacing the Catholic mass. Since most people did not read Latin, if they were going to read the Bible, they needed one in their vernacular, or local language. With the spread of printing, affordable Bibles appeared in many vernaculars for the first time.

## Renaissance Ideas in the Visual Arts

The revived interest in classical civilizations affected the visual arts just as it had other aspects of Renaissance culture. Artists of the Middle Ages had emphasized religious messages rather than portraying their subjects realistically. Paintings looked flat and were decorative. Renaissance artists, however, studied examples of classical art, and along with the influence of humanist ideas, brought a fresh emphasis and style to the visual arts. Renaissance artists began to promote not only religion, but also personal, political, and religious goals of the artists and their patrons.

## ***Italian Art and Architecture***

In addition to using classical themes and styles and focusing on human beings, Renaissance painters and sculptors incorporated new techniques and trends in their work. In contrast to the heavy use of symbolism in medieval painting, Renaissance artists tried to be more realistic in two ways:

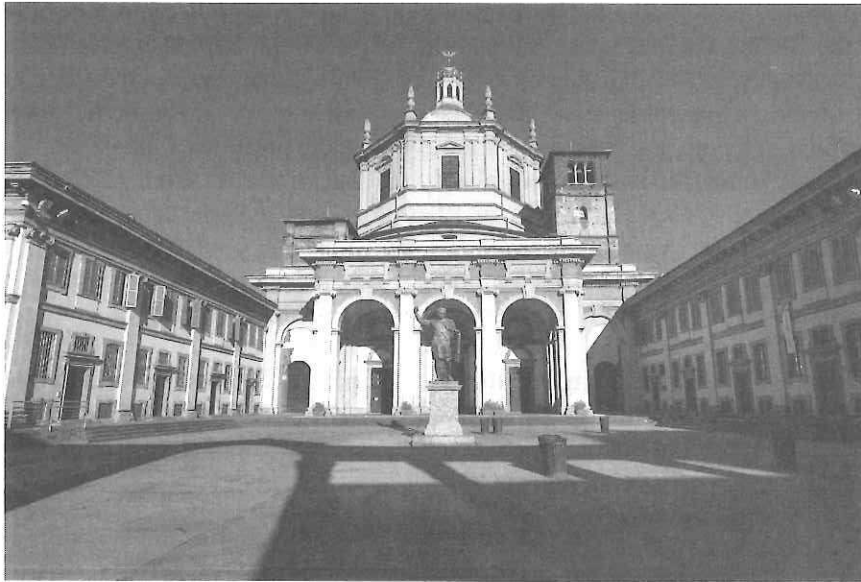
- As artists observed the natural world more closely, they began to aim for **naturalism** in their works. Artists wanted to imitate nature.
- Artists mastered the technique of **geometric perspective**, which used mathematics to help them create the appearance of space and distance in two-dimensional paintings.

**The Medici Family and Florence** Italian Renaissance patrons of the arts were rulers and popes who commissioned works of art mainly to increase their own prestige. Among the most prominent of these patrons were leaders of the Medici family, which controlled Florence for decades. Their commissions of paintings, sculptures, and architecture made Florence the early center of much of the greatest Renaissance art.

**The Church of San Lorenzo** For example, **Cosimo de' Medici** commissioned **Filippo Brunelleschi** (1377–1446) as architect for the rebuilding of the Church of San Lorenzo in Florence (shown on the next page). The Church reflects the influence of Roman architecture with its use of classical columns and rounded arches. Further, it is built to a more human scale than medieval Gothic cathedrals. Brunelleschi also incorporated into the church the largest dome built since classical Rome.



The cathedral in Cologne shows the impressive scale and complexity of Gothic churches.  
Credit: Getty Images



Church of San Lorenzo reflected the human-scale church architecture during the Renaissance.

Credit: Getty Images

**Botticelli** The grandson of Cosimo de' Medici, known as **Lorenzo the Magnificent** (ruled 1469–1492), kept a large group of artists at his court, including **Sandro Botticelli** (1445–1520). Botticelli's famous painting, *Primavera* (*Spring*), displays the artist's interest in classical mythology, featuring the figures of Venus, Cupid, Flora, and Mercury.

**The High Renaissance** The period 1480–1520, when Renaissance art reached its peak, is called the **High Renaissance**. During this period, the city of Rome became prominent as an artistic center. Three artists dominated this period, creative geniuses who advanced far beyond their art.

The first of these dominant artists was **Leonardo da Vinci** (1452–1519). Leonardo is often referred to as the model of the Renaissance man because of the range of his talents. He studied nature and conducted experiments, dissected human bodies to learn more about their structure, and drew designs for machines that were far ahead of his time. Leonardo urged artists to move beyond the earlier emphasis on realism to a portrayal of human beings that reflected their idealized or divine qualities. Two of his most famous paintings are the portrait *Mona Lisa* and *The Last Supper*, a **fresco**, or wall painting using watercolor on wet plaster. *The Last Supper* demonstrates Leonardo's mastery of perspective as well as his skill at depicting idealized human figures with psychological insight.

**Michelangelo** (1475–1564) was the second leading artist of the High Renaissance. Another Renaissance man, **Michelangelo** was a sculptor, painter, architect, and poet. In 1501, the government of Florence commissioned him to create the monumental marble sculpture *David*, in which he portrays the biblical figure of David to reveal the splendor of the human form. Michelangelo

is probably best known for his commission from the pope to paint the ceiling of the **Sistine Chapel** in the Vatican. In the paintings, Michelangelo focused on scenes from the biblical book of Genesis, showing humans as reflections of the divine. In this commission and others, including plans to rebuild **St. Peter's Basilica** in Rome, the pope sought to revitalize the prestige of the papacy and the Papal States, the lands in central Italy that the pope ruled from 756 to 1870.

**Raphael** (1483–1520) was another dominant Renaissance artist who flourished under papal patronage. His many paintings of the Virgin Mary idealized her beauty. The pope commissioned Raphael to paint a series of frescoes in the Vatican Palace. Perhaps the most famous is *School of Athens*, (painted c. 1510–1511).. In this work, Raphael portrayed a gathering of classical scholars, including **Aristotle** and **Plato**, using perspective and other Renaissance techniques to demonstrate harmony, balance, and order—all principles central to both classical and Renaissance art.



Medieval paintings, such as this one of Mary holding Jesus, often appear flat and somewhat out of proportion

**Credit:** Getty Images.



This Renaissance painting of Mary, the mother of Jesus, shows the depth and complexity of art from that period.

Credit: Getty Images

### ***The Northern Renaissance***

Renaissance humanism and art spread to the regions north of the Alps later in the 15th century in a movement known as the **Northern Renaissance**. Northern humanists retained a more religious focus, which influenced artists of the region as well. The naturalism of their art was more human-centered and artists considered individuals and everyday life appropriate objects for their work. Artists in the north were less focused on the beauty of the human form and realistic settings and more on rendering exquisite details in smaller works such as illuminated manuscripts and altarpieces painted on wooden boards.

Flanders, a region in what is now part of France and Belgium, became the leading center of art in the north in the 15th century. The focus on individuals and everyday life as objects in art can be seen in the work of **Jan Van Eyck** (c. 1390–1441) and other northern artists who observed nature closely in order to

depict details accurately, but did not display the skill of Italian artists in the use of perspective and proportion. However, after the spread of Protestantism in northern Europe, the number of religious works of art declined as they became associated with idolatry, or the worship of physical objects as divine.

### ***Mannerist and Baroque Artists***

In the 16th century, monarchies, city-states, and the Catholic Church commissioned works of art to promote their own stature and power. Artists continued to follow the High Renaissance principles by expressing themselves in new ways.

**Mannerism** The term “**Mannerism**” started as a criticism. It came from 16th-century critics who thought contemporary artists were painting in the “manner” of Michelangelo and Raphael but lacked the same substance. However, Mannerist artists did want to break away from some High Renaissance traditions. In particular, they wanted to replace the principles of balance and harmony with more distortion and illusion to add drama to their works.

Like the Renaissance, Mannerism spread from Italy to other parts of Europe. Mannerism also reflected the spiritual and political turmoil following the Protestant Reformation in the 1520s and 1530s. Perhaps the highest example of Mannerism was the work of **El Greco** (1541–1614). He was originally from Crete, studied in Italy, and later settled in Spain where he became a church painter. His elongated figures and dark, eerie colors created feelings of intense emotion.

**Baroque** Around 1570, Mannerism gave way to **Baroque**, also beginning in Italy. Baroque art and architecture brought together Renaissance classical traditions and the strong religious feelings stirred up by the Reformation. It departed from the realism and naturalism of Renaissance works, however, in its dramatically complex appeal to the senses.

Baroque architecture and sculpture became important to Catholic rulers and clergy in central and northern Europe, who resisted the Reformation and commissioned dramatic Baroque architecture and sculpture to stimulate religious devotion in their followers. The courts of Madrid, Vienna, Prague, and Brussels were patrons of Baroque artists. The grand scale and splendor of their palaces, including elaborate decorations, were intended to reflect their power and evoke awe. In the same way, the Catholic Church wanted to reflect the power of the faith in its new churches.

Baroque art spread beyond central and southern Europe and included painting, sculpture, and architecture:

- **Peter Paul Rubens** (1577–1640) became the most prominent Baroque painter from northern Europe. His paintings, which exemplified Baroque style, were dramatic in their use of light and color and dynamic movement and were known for richly sensual nude forms.



- **Gian Lorenzo Bernini** (1598–1680) was a famous Italian Baroque architect and sculptor. He completed the work on St. Peter's Basilica, begun during the High Renaissance.

## Observation-Based Science

Renaissance humanism and art laid the groundwork for new ideas in science to emerge in the 16th and 17th centuries. Humanists' emphasis on learning Greek led later scholars to read a broader range of classical texts, providing a source of ideas that challenged the existing worldview. In addition, artists' close observations of the natural world and use of mathematics to develop techniques, such as perspective, established a new way to learn about the world. Later thinkers expanded the use of experimentation that Leonardo da Vinci and others developed in the late 15th century. These new methods for studying the natural world were the core of the **Scientific Revolution**, which developed slowly between the mid-16th and late-18th centuries.

### *New Ideas in Astronomy*

Since ancient times, scholars have tried to understand their world and the cosmos. The word **astronomy** comes from the ancient Greek word meaning "arrangement of the stars." It is a general term for the study of the universe beyond the earth. **Cosmology** is the branch of astronomy concerned with the origins and structure of the universe.

**Medieval Worldview** The classical cosmology of the Greek philosopher Aristotle and astronomer **Ptolemy** (2nd century C.E.) went unchallenged for more than 1,400 years, forming the basis of the worldview of medieval scholastic philosophers. Aristotle and Ptolemy portrayed a **geocentric** universe—one with the earth at the center of a system of concentric spheres, including the sun, circling around it. According to this worldview, the planets were bodies of light. Medieval scholastic philosophers accepted this view and, in line with their Christian beliefs, taught that God and the souls of those who had been saved existed beyond the outermost sphere of the system.

**Copernicus's New System** Among the first Europeans to challenge the classical view was **Nicolaus Copernicus** (1473–1543), a Polish mathematician and **natural philosopher**, a scholar who studied the physical world. In classical writings, Copernicus found references to ancient Greeks who questioned the geocentric views of Aristotle and Ptolemy and believed instead in a **heliocentric**, or sun-centered, universe.

Copernicus then applied advanced mathematics to earlier astronomical observations to confirm the idea that the planets, including the earth, revolved around the sun. He proved that the perceived motion of the sun came from the earth's spinning on its axis and its annual orbit around the sun. Although he still accepted many of Aristotle's ideas, Copernicus feared that other astronomers would criticize his heliocentric system. Therefore, he only published his work, *On the Revolution of the Heavenly Spheres*, shortly before his death.

**Building on Copernicus** Later natural philosophers built on Copernicus's work, including German astronomer, **Johannes Kepler** (1571–1630). By analyzing precise measurements of planetary orbits, Kepler found them to be elliptical rather than circular. By demonstrating these elliptical orbits, Kepler further supported Copernicus's still-controversial heliocentric model and disputed the religious belief (which even he had originally held) that the circle was the “perfect shape” and reflected the Divine order.

Kepler shared his published work with the Italian mathematician **Galileo Galilei** (1564–1642) in 1597. Galileo then extended Kepler's ideas through use of a new method to observe the planets. He became the first European to build and use a **telescope** for this purpose and thus discovered details that had never been known, such as the moons that circled Jupiter as well as the craters on Earth's moon. With these observations, Galileo showed that the planets were not ethereal bodies but were similar to Earth in their composition. Galileo's book *The Starry Messenger*, published in 1610, reaffirmed the heliocentric system and brought wide attention to these new ideas.

The Catholic Church rejected Galileo's work and found him guilty of heresy. They placed him under house arrest until his death. Although Galileo retracted his ideas publicly, his works continued to circulate. Later, Galileo's work on bodies in motion further challenged Aristotle's views of the universe.

**A New Worldview** The Catholic Church's condemnation of Galileo diminished the growth of science in Italy. The scientist who later brought together the ideas of Copernicus, Kepler, and Galileo was the English mathematician, **Isaac Newton** (1642–1727). Among Newton's many accomplishments was the discovery of the **universal law of gravitation**. Newton published his proofs for this law in *Principia* (1687), demonstrating that gravity applied to objects on Earth and in space and was the force that held the planets in orbit around the sun.

Newton saw the universe as a giant machine with God as the prime mover who set the planets in motion. While Newton's ideas were accepted rather quickly in England, it took almost a century after *Principia* before they were generally accepted on the continent of Europe.

Over a period of approximately 200 years, astronomers had developed a radical new cosmology, challenging the ideas of Aristotle and Ptolemy that were so widely held for about 1,400 years. Such rapid change in such fundamental beliefs shook the foundations of knowledge, but it was just an early step in replacing trust in tradition with reliance on observations and data.

### ***Anatomical and Medical Discoveries***

Much like medieval astronomy, medicine of medieval times was dominated by ideas from ancient Greece and was transformed in the 16th and 17th centuries. The work of the Greek physician **Galen** (2nd century C.E.) dominated the fields of anatomy and physiology. **Anatomy** refers to the structure of the bodies of humans, animals, and plants. **Physiology** refers to how those systems function.

**Traditional Theory of Medicine** Because Galen dissected animals rather than humans, his ideas of human anatomy were often incorrect. He thought there were two different systems of blood flowing through the arteries and veins that controlled different systems of the body. Galen also put forth the **humoral theory** of the body and disease. According to this theory, the body was composed of four humors, namely blood, yellow bile, phlegm, and black bile. Each humor had different combinations of the qualities of warm, cold, wet, and dry. According to Galen's theory, disease was caused by an imbalance of the humors.

**Challenges to Galen's Ideas** Three physicians were most notable in challenging Galen's theories:

- **Paracelsus** (1493–1531) used observation and experiments to develop a theory of disease based on chemical imbalances in specific organs that could be treated with chemical remedies in careful dosages.
- **Andreas Vesalius** (1514–1564) emphasized anatomical research, including dissection of the human body.
- **William Harvey** (1578–1657) corrected Galen's ideas on the **circulatory system**, describing the body instead as an integrated system. Harvey's experiments demonstrated that the heart was the starting point for the circulation of a single system of blood that makes a complete circuit through the body's arteries and veins. Modern physiology is based on Harvey's ideas.

### ***The Scientific Method***

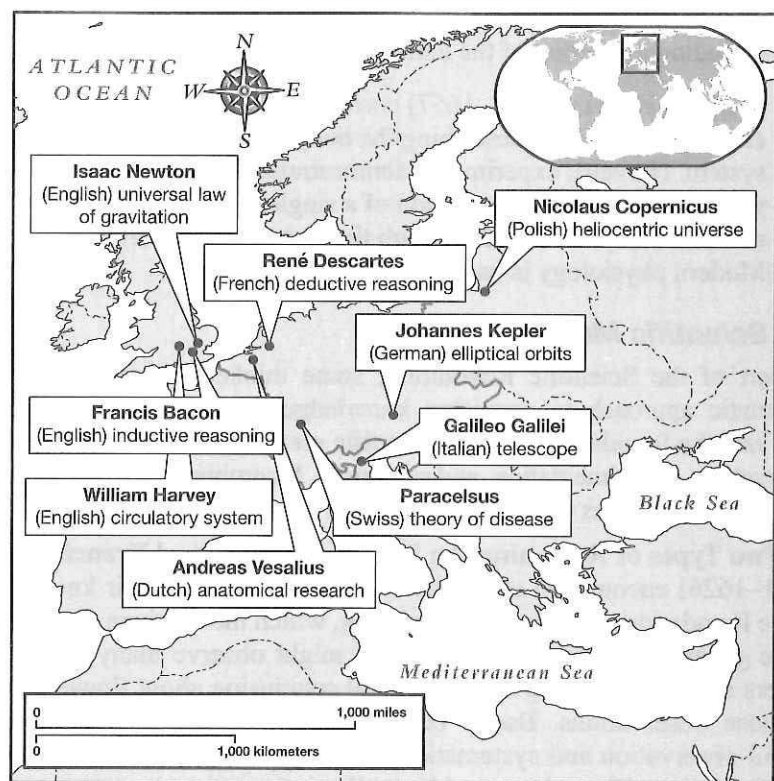
As part of the Scientific Revolution, some thinkers promoted a more systematic approach to acquiring knowledge about the natural world. They laid the foundations for the **scientific method**, an approach based on observation, experimentation, and reasoning. It combines two different but complementary types of reasoning.

**Two Types of Reasoning** An English lawyer named **Francis Bacon** (1561–1626) encouraged scientists of his time to build their knowledge on the foundation of **inductive reasoning**, which moves from the specific to the general. For example, a scientist might observe many individual flowers and then come up with a general conclusion about flowers based on those observations. Bacon believed that scholars should combine careful observation and systematic experimentation to collect small bits of information. Then they could use the information to support valid general conclusions. Bacon encouraged the growth of an international community of natural philosophers who would share the information from their research. The area of work of these scholars came to be called **natural science**.

In contrast, **deductive reasoning** moves from the general to the specific. A leading advocate of this approach was the French philosopher **René Descartes** (1596–1650). He wanted scientists to think like students of geometry. They should start with general principles, similar to geometric axioms, and then apply them using strict logic to understand particular cases.

Isaac Newton brought these two complementary forms of reasoning together into the scientific method. A scientist might begin by conducting experiments that involved observation and data collection. Over time, general conclusions could be drawn from this data. Then these general conclusions might be extended by deductions that led to new hypotheses that could be tested through further experimentation. The goal of this new scientific endeavor was the formulation of general principles about the way the world worked, called **natural laws**, often based on mathematical proofs or expressed as mathematical formulas. Newton’s universal law of gravitation provides one example of a natural law.

#### LEADERS IN THE SCIENTIFIC REVOLUTION



**Exploration and Science** When laying out his method of inductive reasoning, Francis Bacon clearly stated that his goal was for humans to gain practical benefits from scientific knowledge and “conquer nature in action.” An example of this scientific approach can be seen in Europeans’ encounters with the Western Hemisphere that began in the late 15th century (see Chapter 3).

These encounters provided new impetus to formulating natural laws based on a wealth of data gained through direct observation, including new information about geography, types of plants and animals, and different races and cultures. Gathering such data through direct observation supported the new endeavor of expanding scientific knowledge in general.

Science Before and After the Renaissance		
Area	Medieval Science	Post-Renaissance Science
Goal	To demonstrate the truth of traditional Christian beliefs	To understand the natural world
Background of Natural Philosophers	Most were clergy members	Most were secular
Classical Sources	Relied on Aristotle, Ptolemy, and Galen	Drew on a broad range of classical sources
Methods	Relied primarily on logical analysis	Combined observation and experiments with logic and mathematical calculations
Relationship with Religious Authorities	The Catholic Church judged the validity of scientific ideas	Science and religion were separate paths of inquiry

### ***Persistence of Traditional Views***

The acquisition of knowledge through inductive and deductive reasoning makes up an inquiry-based **epistemology**, or philosophy of knowledge—a way of understanding what we know and how we know it. While this new method dominated the thinking of natural philosophers during the 16th and 17th centuries, it did not generally clash with more traditional ideas about how people learned. Europeans continued to believe that spiritual forces governed the cosmos. Most scientists of the time believed in God and accepted a role for religion. Only later, in the 19th century, did people disagree over the boundary between science and religion.

Scientists of the 16th and 17th centuries also continued to accept two other traditional explanations about the world: alchemy and astrology.

- **Alchemy** was a medieval and Renaissance approach to chemistry primarily focused on discovering a method to turn common metals into gold. In a broader sense, alchemy was concerned with transformation and saw the world as filled with divinity.
- **Astrology** was originally synonymous with astronomy, but during the Renaissance it came to mean the study of the heavenly bodies as they influenced human activity.

These traditional ideas continued to appeal to elites and to some natural philosophers. For example, Kepler studied astrology and was interested in the idea of a sacred geometry in the universe. Newton wrote extensively about his experiments in alchemy. Paracelsus's view that a human being was a small reflection of the larger universe was similar to the basis of astrology. These traditional views persisted partly because, like the new science, they supported the idea that humans could understand the universe and make predictions about it.

#### HISTORICAL PERSPECTIVES: WHAT MADE PEOPLE CIVIL?

Since at least the days of the classical Greeks and Romans, writers in what is today Europe have been commenting on what social behavior is proper. However, not only have ideas of civility changed, but also people have changed their ideas about the roles of men and women in setting the standards.

**Defining Civility** Baldassare Castiglione's *The Book of the Courtier* (1528) was one of the most influential books in 16th-century Europe. Castiglione told an engaging story about an after-dinner conversation among gentlemen in the court of the duke who ruled Urbino, a 16th-century Italian city. The men discussed the qualities of the perfect courtier and how one achieves civility. *The Book of the Courtier* provided guidance for men throughout Europe who aspired to serve and influence powerful princes and kings. Castiglione focused on the causes and results of individual behavior.

In contrast to Castiglione, 20th-century German sociologist Norbert Elias, in *The Civilizing Process* (1939), focused on the social context of civility. He explored how development of manners and individual personality was part of the formation and centralization of power within modern states. Civility was part of the taming of individual passions in order to create a stable government.

**The Influence of Women** On the surface, women did not seem to play a major role in Castiglione's *The Book of the Courtier*—the discussion was among men. However, under the influence of feminism in the late 20th century, scholars took a closer look at gender roles in the book. They pointed out that women, though not key participants in the discussion, were important. They were not only present, but they determined the guest list, set the rules of the “game,” and influenced the men to behave with civility.

Some historians argued that women of the Renaissance represented a higher standard of civility than men. As mothers, wives, and teachers, women worked behind the scenes to provide men with models of behavior to use when trying to work with and impress a ruler. If women failed to provide such models, the men would not become good courtiers. Then a ruler would lack the skilled advisors necessary to lead the state. Whether women became more or less influential than men during the Renaissance depends, in part, on the point of view of the historian about what determines influence.



## KEY TERMS BY THEME

### Knowledge

Aristotle  
Plato  
Ptolemy  
Nicolaus Copernicus  
Johannes Kepler  
Galileo Galilei  
Isaac Newton  
Galen  
Paracelsus  
Andreas Vesalius  
William Harvey  
Francis Bacon  
René Descartes  
Scientific Revolution  
astronomy  
cosmology  
geocentric  
natural philosopher  
heliocentric  
telescope  
universal law of gravitation  
anatomy  
physiology  
humoral theory  
circulatory system  
scientific method  
inductive reasoning  
natural science  
deductive reasoning  
natural law

### epistemology

alchemy  
astrology

### States

Holy Roman Empire  
city-state  
Florence  
Venice  
Milan  
democracy  
Roman Republic  
representative government  
Niccolò Machiavelli

### Society: Individuals

Petrarch  
Cicero  
Baldassare Castiglione  
Johannes Gutenberg  
Martin Luther  
Cosimo de' Medici  
Sandro Botticelli  
Leonardo da Vinci  
Michelangelo  
Raphael  
Jan Van Eyck  
El Greco  
Peter Paul Rubens  
Lorenzo Bernini  
Filippo Brunelleschi  
Lorenzo the Magnificent

### Society

Renaissance  
classical  
Middle Ages  
Roman Catholic Church  
theology  
humanists  
scholasticism  
secular  
individualism  
philological  
liberal arts  
humanities  
Renaissance man  
civic humanist culture  
despotism  
movable type  
printing press  
Gutenberg Bible  
vernacular literature  
Protestant Reformation  
naturalism  
geometric perspective  
High Renaissance  
fresco  
Sistine Chapel  
St. Peter's Basilica  
Northern Renaissance  
Mannerism  
Baroque

## MULTIPLE-CHOICE QUESTIONS

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Questions 1–3 refer to the passage below.

“The foundations of all true learning must be laid in the sound and thorough knowledge of Latin: which implies study marked by a broad spirit, accurate scholarship, and careful attention to details . . . Without it the great monuments of literature are unintelligible, and the art of composition impossible. . . .

But we must not forget that true distinction is to be gained by a wide and varied range of such studies as conduce to the profitable enjoyment of life . . .

First amongst such studies I place History: a subject which must not on any account be neglected by one who aspires to true cultivation . . . For the careful study of the past enlarges our foresight in contemporary affairs and affords to citizens and to monarchs lessons of incitement or warning in the ordering of public policy. . . .

The great Orators of antiquity must by all means be included. Nowhere do we find the virtues more warmly extolled, the vices so fiercely decried. . . .

I come now to Poetry and the Poets. . . . For we cannot point to any great mind of the past for whom the Poets had not a powerful attraction.”

Leonardo Bruni, *On Learning and Literature*, c. 1405

1. The passage most clearly shows the influence of which development?
  - a) The use of the scientific method to critique traditional knowledge
  - b) The development of mandatory systems of public education
  - c) A renewed interest in classical Greek and Roman texts among humanist thinkers
  - d) The increase of publications questioning Papal authority
2. The methods of learning described in this passage contributed most directly to which change in thinking?
  - a) Political revolutions based on the idea of natural rights
  - b) The discovery of gravity and the laws of motion
  - c) New ideas about government and individual behavior
  - d) The rediscovery of secular ideas from ancient Greece and Rome
3. Compared to Bruni’s view of education in the 15th century, intellectuals in the 18th century tended to:
  - a) emphasize intuition and emotion more than formal education.
  - b) be less reliant on classical sources of knowledge.
  - c) reject education as a means of social progress.
  - d) place more faith in religious authorities.

**Questions 4–5 refer to the excerpt below.**

“I think that in discussions of physical problems we ought to begin not from the authority of scriptural passages but from sense experiences and necessary demonstrations; for the holy Bible and the phenomena of nature proceed alike from the divine Word the former as the dictate of the Holy Ghost and the latter as the observant executrix [a female who carries out orders of another] of God’s commands. . . .

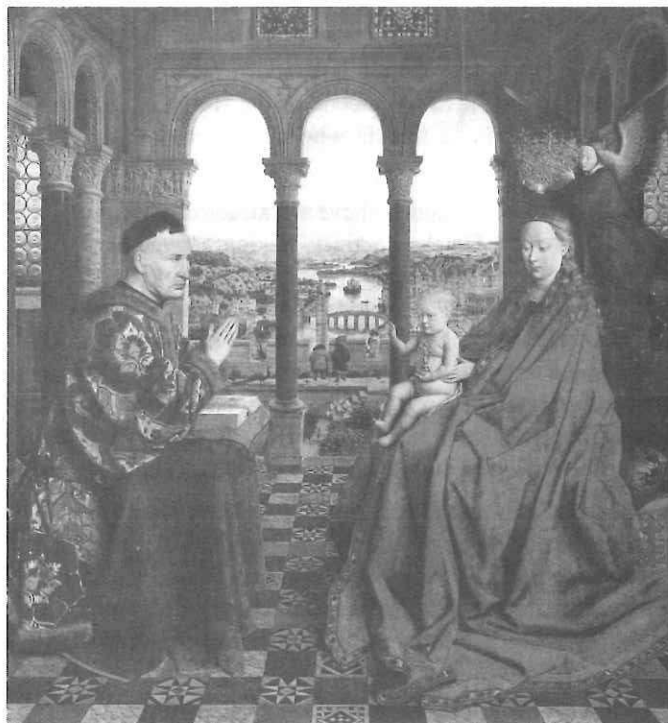
From this I do not mean to infer that we need not have an extraordinary esteem for the passages of holy Scripture. On the contrary, having arrived at any certainties in physics, we ought to utilize these as the most appropriate aids in the true exposition of the Bible and in the investigation of those meanings which are necessarily contained therein, for these must be concordant [in agreement] with demonstrated truths. I should judge that the authority of the Bible was designed to persuade men of those articles and propositions which, surpassing all human reasoning could not be made credible by science, or by any other means than through the very mouth of the Holy Spirit . . .

But I do not feel obliged to believe that the same God who has endowed us with senses, reason and intellect has intended us to forego their use and by some other means to give us knowledge which we can attain by them. He would not require us to deny sense and reason in physical matters which are set before our eyes and minds by direct experience or necessary demonstrations.”

Galileo Galilei, “Letter to Madame Christina de Lorraine,  
Grand Duchess of Tuscany,” 1615

4. This passage most clearly demonstrates the influence of which of the following developments?
  - a) Christian humanist interest in original translations of the Bible
  - b) The Scientific Revolution’s promotion of reasoning and experimentation
  - c) Renaissance thinkers’ reliance on classical Greek and Roman sources
  - d) The Protestant Reformation’s emphasis on the authority of scripture
5. This passage best demonstrates which of the following about scientific thinkers in the 17th century?
  - a) They continued to hold religious worldviews as they pursued scientific inquiry.
  - b) They received substantial support from political authorities.
  - c) They developed mathematical models to prove scientific ideas.
  - d) They rejected the role of divine forces in the universe.

Questions 6–8 refer to the image below.



In this 1435 painting, Dutch artist Jan Van Eyck shows Nicolas Rolin, a wealthy contributor to the Catholic Church, seated with the Virgin Mary, who is holding Jesus.

**Credit:** <http://www.louvre.fr/en/oeuvre-notices/virgin-chancellor-rolin>

6. This painting reflects which of the following developments in the Northern Renaissance?
- a) The portrayal of individuals interacting with nature
  - b) The portrayal of the everyday life of common people
  - c) The portrayal of subjects from classical mythology
  - d) The portrayal of religious content as the subject matter
7. Based upon the image and its intended audience, the inclusion of Rolin in the painting was most likely a reflection of
- a) the artist's belief in the divine right of kings.
  - b) the desire of secular rulers to control Church institutions.
  - c) the effort of elites to enhance their prestige by supporting the arts.
  - d) the use of art to promote civic virtue.

8. The emergence of Baroque and Mannerist artistic styles were different than the style that influenced the above painting in which of the following ways?
- a) The depiction of landscapes rather than people as the focal point
  - b) The inclusion of more dramatic and exaggerated human forms
  - c) The rejection of religious subjects and symbols
  - d) The use of abstract shapes and colors to convey the artist's vision

### SHORT-ANSWER QUESTIONS

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**1. Use the passage below to answer all parts of the question that follows.**

"The dissemination of new humanist learning during the Renaissance typically included five methods: tutoring and self-directed study in families, education in schools, humanist lecturing, conversations in small private groups and larger coteries, and correspondence. . . . In the fifteenth century and early sixteenth century many Italian women displayed the highest technical competence in the study, interpretation, and exposition of the revived humanist learning. Some [of] them . . . could hold their own in matters of scholarship with the best of their male contemporaries and . . . were accepted and even acclaimed elsewhere."

Mary R. Beard, *Women as a Force in History*, 1946

- a) Explain how ONE piece of evidence supports Beard's argument regarding the effects of the Renaissance on women in Europe.
- b) Explain how ONE piece of evidence undermines Beard's argument regarding the effects of the Renaissance on women in Europe.
- c) Explain how ONE feature of 20th-century life might have influenced Beard's interpretation of the Renaissance.

**2. Answer all parts of the question that follows.**

- a) Identify ONE way in which classicism influenced the development of the Renaissance in Europe from 1450 to 1550.
- b) Explain ONE difference between the Italian Renaissance and the Northern Renaissance in the period from 1450 to 1550.
- c) Explain ONE similarity between the Italian Renaissance and the Northern Renaissance in the period from 1450 to 1550.

## LONG ESSAY QUESTIONS

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1. Evaluate to what extent changes in technology influenced European life in the 14th to 16th centuries.
2. Evaluate to what extent changes in how people viewed history influenced European life in the 14th to 16th centuries.

## REFLECT ON THE CHAPTER ESSENTIAL QUESTION

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1. In one to three paragraphs, explain how the worldview of European intellectuals shifted in the 15th century.

### WRITE AS A HISTORIAN: UNDERSTANDING THE PROMPT

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When answering an essay question, try to think as a historian does by understanding complex relationships and analyzing information to support a position. Read the prompt slowly. Circle direction words, such as *analyze*, *evaluate*, *validate* or *refute*, or *compare* or *contrast*. Each of these words has its own meaning:

- *Evaluate* means to identify positive and negative aspects or determine something's significance.
- *Analyze* means to examine causes and effects, to explain why something happened; more broadly, it means to examine the structure of something in order to explain or interpret it.
- *Validate* means to show support for an idea. *Refute* means to argue against it.
- *Compare* means to explore similarities and differences between ideas or things. *Contrast* means to explore differences. Some questions ask for compare and contrast.
- *Examine continuity and change over time* means to understand how and why some things have changed in a given period of time while other things have remained the same.

*Identify the reasoning skill that each statement requires.*

1. Explain the social and economic changes in Europe that resulted from the increase in wealth produced by overseas trade.
2. Compare and contrast Catholicism and Protestantism in terms of doctrine and practice.



3. What effects did the values of individualism, subjectivity, and emotion have on changing traditional political ideologies' artistic forms?

Writing notes in the margins is one way to plan your response to a question. If you use accurate historical evidence and clearly organize your thoughts, writing will be easier, and your argument will be easier for readers to identify.

*For each of the following prompts, which statement below it would be most useful in the argument answering it?*

4. Analyze the ways in which the revival of classical texts influenced Italian society during the Renaissance.
- a. Classical Greek and Roman texts were written by people such as the playwright Euripides, the epic poet Homer, and the satirist Horace.
  - b. The intellectuals of the Renaissance, later known as humanists, used their knowledge of Greek and Latin to revive classical ideas that put humans at the center of all things.
5. Compare and contrast the styles of the visual arts in Italy and in the Northern Renaissance.
- a. Although both Italian and Northern Renaissance artists depicted religious subjects, Northern Renaissance artists focused more on everyday life and human-centered themes.
  - b. The Italian Renaissance produced some of the most famous artists in history, including Michelangelo, Donatello, and Raphael.
6. Analyze the ways in which the invention of the printing press affected European society during the Renaissance.
- a. The printing press spread Renaissance ideas beyond Italy and created more vernacular literature, which led to a rise in national cultures and a lasting challenge to the power of the Catholic Church.
  - b. Europe was affected by a movement called the Protestant Reformation, started by Martin Luther in Germany in 1517.

## Conflicts over Religious Pluralism

*It is certainly the pope's sentiment that if indulgences, which are a very insignificant thing, are celebrated with one bell, one procession, and one ceremony, then the gospel, which is the very greatest thing, should be preached with a hundred bells, a hundred processions, a hundred ceremonies.*

—Martin Luther, 95 Theses, 1517

**Essential Question:** How did religious pluralism challenge the concept of a unified Europe?

One early reason for Martin Luther's demands for religious reform stemmed from concerns over the Catholic Church's policy of selling **indulgences**, a practice that had come to mean the buying of forgiveness for sin. However, over time, many reformers called into question other Catholic practices and doctrines, such as papal infallibility—the belief that the word of the pope is supreme on matters of faith. Such concerns fractured the unity of Christianity in Central and Western Europe, bringing the emergence of differing and often competing sects of Christianity in the 16th century, a religious revolution known as the **Reformation**.

### Reforms in the Christian Church

The growing Renaissance interest in **secular**, or nonreligious, matters strongly affected the Roman Catholic Church in Europe. The desire for fine art and material wealth caused the Church to be a patron for painters such as Michelangelo and to build grand cathedrals. Thus, in the view of the reformers, many Church officials, especially the high clergy, had turned away from their true religious responsibilities. In response to this and other practices, **Christian Humanists** called for religious reform.

#### **Christian Humanists Seek Religious Reform**

While influenced by the Italian Renaissance, Christian Humanists in Northern Europe wanted to use their intellectual achievements and love of the classics to inspire the Christian beliefs. Christian Humanists were critical of the growing secular spirit of the Church and wanted to restore what they considered a