Part 1: General Science

Time: 11 minutes

1. Which of the following elements is expected to be least reactive?
   a. Kr
   b. F
   c. Ca
   d. K

2. When the Moon is new, which is true?
   a. A solar eclipse could occur.
   b. A lunar eclipse could occur.
   c. An Earth eclipse could occur.
   d. A corona eclipse could occur.

3. What is the mass number of an atom with 60 protons, 60 electrons, and 75 neutrons?
   a. 60
   b. 120
   c. 135
   d. 195

4. Which of the following is the main function of the urinary bladder?
   a. to convert urea to urine
   b. to absorb water
   c. to store bile salts
   d. to store urine for excretion

5. Which of the following is known as the "powerhouse of the cell"?
   a. chloroplast
   b. vacuole
   c. endoplasmic reticulum
   d. mitochondrion

6. Which of the following represents the ground state of an ion in the alkaline earth family?
   a. $1s^2 2s^2$
   b. $1s^2 2s^2 2p^1$
   c. $1s^2 2s^2 2p^2$
   d. $1s^2 2s^2 2p^3$

7. Which process requires the most energy for a cell to transport material through its cell membrane?
   a. facilitated diffusion
   b. osmosis
   c. active transport
   d. filtration

8. In the reaction $2Cu_2S + 3O_2 \rightarrow 3Cu_2O + 2SO_2$, if 24 moles of Cu_2O are to be prepared, then how many moles of O_2 are needed?
   a. 24
   b. 36
   c. 16
   d. 27

9. In a food chain, which of the following are the producers?
   a. dead organic matter
   b. plant-eating animals
   c. meat-eating animals
   d. green plants

10. A mixture consisting of 8.0 g of oxygen (MW = 16) and 14 g of nitrogen (MW = 14) is prepared in a container such that the total pressure is 750 mm Hg. The partial pressure of oxygen in the mixture is
    a. 125 mm Hg.
    b. 500 mm Hg.
    c. 135 mm Hg.
    d. 250 mm Hg.

11. Membranes in cells are used for all of the following EXCEPT
  a. providing rigid support.
  b. regulating transport of substances.
  c. containing DNA.
  d. creating cellular organelles.

12. The energy of the Sun is created through which chemical reaction?
  a. single combination of molecules
  b. splitting larger elements into smaller elements
  c. combustion of fuel and oxygen
  d. combining of smaller elements to larger elements

13. The Himalayas are the result of
  a. a continental collision zone.
  b. a plate subduction zone.
  c. a volcanic zone.
  d. a ridge spreading zone.

14. The time required for half the atoms in a sample of a radioactive element to disintegrate is known as the element's
  a. decay period.
  b. lifetime.
  c. radioactive period.
  d. half-life.

15. Bacteria are part of which of the following kingdoms?
  a. protist
  b. monera
  c. animal
  d. plant

16. A 10 g sample of hydrogen sulfide gas is in a closed vessel at 127°C and 6 atm. What would the pressure be in the vessel when the temperature of the sample is changed to 27°C and the volume remains the same?
  a. 2 atm
  b. 4 atm
  c. 6 atm
  d. 8 atm

17. If a cell is in an environment that lacks oxygen, how will it get its energy?
  a. photosynthesis
  b. transpiration
  c. fermentation
  d. cellular respiration

18. A pressure of 740 mm Hg is the same as
  a. 1 atm.
  b. 0.974 atm.
  c. 1.03 atm.
  d. 0.740 atm.

19. Which adaptation do protists and plants share that separate them from fungi?
  a. chloroplasts
  b. nucleus
  c. cell wall
  d. specialized tissue

20. When aluminum (Al) and oxygen (O) form an ionic compound, it is represented as
  a. AlO
  b. Al_3O_2
  c. Al_2O_3
  d. $Al_{13}O_8$

21. In a cell with 16 chromosomes, how many gametes with how many chromosomes would be present after meiosis?
  a. 2 with 8 chromosomes
  b. 2 with 16 chromosomes
  c. 4 with 4 chromosomes
  d. 4 with 8 chromosomes

22. To get the most accurate data, where would be the best placement of a weather balloon?
  a. the mesosphere
  b. the troposphere
  c. the stratosphere
  d. the thermosphere

23. What is the proper nomenclature for the covalent molecule CCl_4?
  a. carbon chloride
  b. carbon chlorine
  c. carbon tetrachloride
  d. carbon quadrachloride

24. If the half-life for a radioactive element is 6 minutes, what was the initial mass of a sample with 40 g left after 18 minutes?
  a. 320 g
  b. 160 g
  c. 80 g
  d. 40 g

25. Viruses appear to be living organisms for the following characteristics EXCEPT
  a. nucleic acids.
  b. enzymes.
  c. adaptation.
  d. cellular reproduction.

Part 2: Arithmetic Reasoning

Time: 36 minutes

1. Michael scores 260 points during his junior year on the school basketball team. He scored 25% more points during his senior year. How many points did he score during his senior year?
  a. 195
  b. 65
  c. 325
  d. 345

2. The dwarf planet Pluto is estimated at a mean distance of 3,666 million miles from the Sun. The planet Mars is estimated at a mean distance of 36 million miles from the Sun. How much closer to the Sun is Mars than Pluto?
  a. 36,300,000 million miles
  b. 36,300 million miles
  c. 3,630 million miles
  d. 363 million miles

3. How many acres are contained in a parcel 121 feet wide and 240 yards deep? (one acre = 43,560 square feet)
  a. 1 acre
  b. $1\frac{1}{2}$ acres
  c. 2 acres
  d. $2\frac{1}{2}$ acres

4. On a certain day, the nurses at a hospital worked the following number of hours: Nurse Howard worked 8 hours; Nurse Pease worked 10 hours; Nurse Campbell worked 9 hours; Nurse Grace worked 8 hours; Nurse McCarthy worked 7 hours; and Nurse Murphy worked 12 hours. What is the average number of hours worked per nurse on this day?

a. 7
b. 8
c. 9
d. 10

Use the following table to answer question 5.

PRODUCTION OF FARM-IT TRACTORS FOR THE MONTH OF APRIL	
FACTORY	APRIL OUTPUT
Dallas	450
Houston	425
Lubbock	?
Amarillo	345
TOTAL:	1,780

5. What was Lubbock's production in the month of April?

a. 345
b. 415
c. 540
d. 560

6. At the movies, Lucinda bought food for herself and her friend Rae, including: one box of popcorn to share at $5, one box of Junior Mints for each of them at $2 a box, and one soft drink for each at $3 apiece. Rae bought a ticket for each at $7 apiece. Who spent the most money and by how much?

a. Rae by $3
b. Rae by $7
c. Lucinda by $1
d. Lucinda by $2

7. John has started an egg farm. His chickens produce 480 eggs per day, and his eggs sell for $2 a dozen. How much does John make on eggs per week? (one week = seven days)

a. $480
b. $500
c. $560
d. $600

8. Maria made $331.01 last week. She worked $39\frac{1}{2}$ hours. What is her hourly wage?

a. $8.28
b. $8.33
c. $8.38
d. $8.43

9. For health reasons, Amir wants to drink eight glasses of water a day. He's already had six glasses. What fraction does Amir have left to drink?

a. $\frac{1}{8}$
b. $\frac{1}{6}$
c. $\frac{1}{4}$
d. $\frac{1}{3}$

10. Rita is eight decades old. How many years old is Rita?
- **a.** 40 years old
- **b.** 16 years old
- **c.** 64 years old
- **d.** 80 years old

11. A street sign reads "Loading Zone 15 Minutes." If a truck pulls into this zone at 11:46 A.M., by what time must it leave?
- **a.** 11:59 A.M.
- **b.** 12:01 P.M.
- **c.** 12:03 P.M.
- **d.** 12:06 P.M.

12. It takes three firefighters $1\frac{2}{5}$ hours to clean their truck. At that same rate, how many hours would it take one firefighter to clean the same truck?
- **a.** $2\frac{4}{7}$ hours
- **b.** $3\frac{4}{5}$ hours
- **c.** $4\frac{1}{5}$ hours
- **d.** $4\frac{2}{5}$ hours

13. One colony of bats consumes 36 tons of mosquitoes per year. At that rate, how many pounds of mosquitoes does the same colony consume in a month?
- **a.** 36,000 pounds
- **b.** 12,000 pounds
- **c.** 6,000 pounds
- **d.** 3,000 pounds

14. At birth, Winston weighed $6\frac{1}{2}$ pounds. At one year of age, he weighed $23\frac{1}{8}$ pounds. How much weight, in pounds, did he gain?
- **a.** $16\frac{5}{8}$ pounds
- **b.** $16\frac{7}{8}$ pounds
- **c.** $17\frac{1}{6}$ pounds
- **d.** $17\frac{3}{4}$ pounds

15. A recipe calls for $\frac{1}{4}$ teaspoon of red pepper. How much red pepper would you need for half a recipe?
- **a.** $\frac{1}{10}$ teaspoon
- **b.** $\frac{1}{8}$ teaspoon
- **c.** $\frac{1}{6}$ teaspoon
- **d.** $\frac{1}{2}$ teaspoon

16. Fifty-four students are to be separated into six groups of equal size. How many students are in each group?
- **a.** 8
- **b.** 9
- **c.** 10
- **d.** 12

17. Yetta just got a raise of $3\frac{1}{4}$%. Her original salary was $30,600. How much does she make now?
- **a.** $30,594.50
- **b.** $31,594.50
- **c.** $32,094.50
- **d.** $32,940.50

18. Ashley's car insurance costs her $115 per month. How much does it cost her per year?
- **a.** $1,150
- **b.** $980
- **c.** $1,380
- **d.** $1,055

19. It is 19.85 miles from Jacqueline's home to her job. If she works five days a week and drives to work, how many miles does Jacqueline drive each week?
- **a.** 99.25 miles
- **b.** 188.5 miles
- **c.** 190.85 miles
- **d.** 198.5 miles

20. On a four-day trip, Carrie drove 135 miles the first day, 213 miles the second day, 159 miles the third day, and 189 miles the fourth day. Which of the following choices is the best approximation of the total miles Carrie drove during the trip?
   a. 600
   b. 700
   c. 400
   d. 800

21. How many inches are there in four feet?
   a. 12 inches
   b. 36 inches
   c. 48 inches
   d. 52 inches

22. On a particular morning the temperature went up 1° every two hours. If the temperature was 53° at 5 A.M., at what time was it 57°?
   a. 7 A.M.
   b. 8 A.M.
   c. 12 P.M.
   d. 1 P.M.

23. Of 360 students polled, 150 participate in extracurricular activities. Approximately what percent of the students do NOT participate in extracurricular activities?
   a. 32%
   b. 42%
   c. 52%
   d. 58%

24. How many ways can four students line up in a line, if the order matters?
   a. 4
   b. 8
   c. 16
   d. 24

25. Ted has to write a $5\frac{1}{2}$-page paper. He's finished $3\frac{1}{3}$ pages. How many pages does he have left to write?
   a. $1\frac{3}{5}$
   b. $1\frac{7}{8}$
   c. $2\frac{2}{3}$
   d. $2\frac{1}{6}$

26. Larry purchased three pairs of pants for $18 each and five shirts for $24 each. How much did Larry spend?
   a. $42
   b. $54
   c. $174
   d. $186

27. The light on a lighthouse blinks 45 times a minute. How long will it take the light to blink 405 times?
   a. 11 minutes
   b. 4 minutes
   c. 9 minutes
   d. 6 minutes

28. Brian's 100-yard dash time was 2.68 seconds more than the school record. His time was 13.4 seconds. What is the school record?
   a. 10.72 seconds
   b. 11.28 seconds
   c. 10.78 seconds
   d. 16.08 seconds

29. Jason's hair salon charges $63 for a haircut and color, which is $\frac{3}{4}$ of what Lisa's hair salon charges. How much does Lisa's hair salon charge?
   a. $65
   b. $21
   c. $42
   d. $84

30. Two quarters are equivalent to how many dimes?
   a. 2
   b. 4
   c. 5
   d. 10

Part 3: Word Knowledge

Time: 11 minutes

1. *Glare* most nearly means
   a. scowl.
   b. hide.
   c. display.
   d. summon.

2. *Civil* most nearly means
   a. unkind.
   b. trite.
   c. public.
   d. questionable.

3. *Peer* most nearly means
   a. apple.
   b. connote.
   c. fellow.
   d. dock.

4. *Fiasco* most nearly means
   a. festival.
   b. disaster.
   c. happenstance.
   d. ceremony.

5. *Chasm* most nearly means
   a. gorge.
   b. charm.
   c. bridle.
   d. criticize.

6. *Expertise* most nearly means
   a. activity.
   b. courage.
   c. mastery.
   d. effort.

7. *Outlandish* most nearly means
   a. distant.
   b. absurd.
   c. pastoral.
   d. belligerent.

8. *Pine* most nearly means
   a. clean.
   b. hate.
   c. resolve.
   d. crave.

9. *Exploit* most nearly means
   a. answer.
   b. abuse.
   c. enquire.
   d. persuade.

10. *Culmination* most nearly means
   a. realization.
   b. disaster.
   c. serendipity.
   d. persuasion.

11. *Feign* most nearly means
   a. jab.
   b. swoon.
   c. pretend.
   d. dread.

12. *Heed* most nearly means
   a. trek.
   b. consider.
   c. consolidate.
   d. bound.

13. *Edge* most nearly means
   a. diffuse.
   b. point.
   c. force.
   d. dissuade.

14. *Elevate* most nearly means
   a. lessen.
   b. mention.
   c. affix.
   d. hoist.

15. *Appoint* most nearly means
   a. score.
   b. discuss.
   c. nominate.
   d. ensure.

16. *Hoard* most nearly means
   a. stockpile.
   b. burrow.
   c. mine.
   d. dessert.

17. *Hub* most nearly means
   a. counsel.
   b. elder.
   c. center.
   d. extension.

18. *Tame* most nearly means
   a. lost.
   b. wild.
   c. pushy.
   d. submissive.

19. *Irk* most nearly means
   a. shrug.
   b. irritate.
   c. devour.
   d. avoid.

20. *Loom* most nearly means
   a. disappear.
   b. sew.
   c. surface.
   d. teach.

21. *Fitful* most nearly means
   a. erratic.
   b. angry.
   c. tired.
   d. strong.

22. *Gaudy* most nearly means
   a. massive.
   b. mindful.
   c. tasteful.
   d. flashy.

23. *Flaunt* most nearly means
   a. conceal.
   b. parade.
   c. trust.
   d. fray.

24. *Flex* most nearly means
   a. bend.
   b. binge.
   c. rid.
   d. consume.

25. *Tantalize* most nearly means
   a. pronounce.
   b. reign.
   c. bother.
   d. tease.

26. Even though she's almost 80, my grandmother seems _____; she still plays golf three times a week and has an active social life.
 a. indefatigable
 b. persistent
 c. feeble
 d. senile

27. The treasure hunter's interest was _____ by a small glimmer of gold at the bottom of the pit.
 a. piqued
 b. enhanced
 c. lessened
 d. questioned

28. Although the novice doctor had just started his internship, he was already _____ by the amount of work required.
 a. perplexed
 b. overwhelmed
 c. energized
 d. negated

29. Desert dwellers tend to be _____, moving from place to place as water sources dry up.
 a. listless
 b. nomadic
 c. spontaneous
 d. conscientious

30. Mr. Crane did not say anything about being fired from his last job because he did not want to _____ his chances of being hired by the new company.
 a. jeopardize
 b. stigmatize
 c. evade
 d. divulge

31. Carlos found the movie so _____ that he continued to feel immersed in the film's world for hours afterward.
 a. engrossing
 b. enlightening
 c. enchanting
 d. inventive

32. The king furiously declared that the philosopher should be _____ by society for his anti-authoritarian views.
 a. embraced
 b. lauded
 c. reprimanded
 d. ostracized

33. Climbing Mount Everest may be a daunting prospect, but successful climbing expeditions in the past have proved that the peak is not _____.
 a. formidable
 b. frigid
 c. insurmountable
 d. mundane

34. As a pacifist, I _____ all forms of violence.
 a. deride
 b. entreat
 c. endorse
 d. deplore

30. General Wilkenson ordered his troops to charge at the invading forces and _____ them from the vulnerable town.
 a. sequester
 b. incense
 c. condense
 d. repel

Part 4:
Paragraph Comprehension

Time: 13 minutes

Our daily lives are filled with machines. We drive cars, operate computers, ride bicycles, talk on telephones, and use a *myriad* number of machines without even thinking about it. But did you know that all machines are based on six simple machines? What's more, all simple machines fall into one of two categories: the lever or the wedge. The lever is a simple machine that allows a person to lift a heavy weight using less energy than would be required to lift it directly. A wedge is a simple machine that separates two or more objects.

There are six basic machines, each of which uses either lever action or wedge action. The screw, for example, uses wedge action to separate the wood that it's being screwed into. A pulley uses lever action to enable a person to use less force to lift heavy objects. An inclined plane uses wedge action to separate an object from the ground; you can even see the wedge shape of an inclined plane if you look at it from the side. And the sixth simple machine, the wheel and axle, uses lever action to force the wheel to turn using less energy than would be required by manually spinning it.

1. What is the main idea of this passage?
   a. Wheels and pulleys are simple machines.
   b. All machines are based on six simple machines.
   c. Screws use lever action.
   d. Machines are complicated.

2. Which of the following statements is best supported by this passage?
   a. Screwdrivers are complex machines.
   b. Computers are simple machines.
   c. A car uses many simple machines to run.
   d. Gravity was discovered by Isaac Newton.

3. Which of the following is *not* a simple machine?
   a. a screw
   b. a pushbutton
   c. a wedge
   d. a pulley

4. As used in the passage, *myriad* most nearly means
   a. mythical.
   b. confusing.
   c. mirror image.
   d. many.

The town council met Wednesday night to discuss the recent vandalism at the park. Police have stated that the vandalism is caused by several youths in town who are angry because the park closes at sunset. Several parents spoke out, however, to say that the problems are being caused by *transient* workers who have no place to sleep. The mayor disagreed and suggested that the vandalism is the work of students from the rival high school in the next town.

Since the council can't take any action before the next meeting on the 3rd of next month, police have been instructed to increase security at the park at night. Town council members also asked the school board to *implement* stronger methods of policing at high school athletic events to ensure that students do not bring cans of spray paint or other tools of vandalism.

5. According to the passage, who believes that the vandalism is being caused by rivalry between two local schools?
   a. the police
   b. parents
   c. the mayor
   d. not stated

6. As used in this passage, *transient* most nearly means
a. passing through.
b. a window above a doorway.
c. athletic.
d. angry.

7. The town council will next meet on
a. June 4.
b. the 3rd of next month.
c. the first Wednesday of the month.
d. the 3rd of this month.

8. As used in the passage, *implement* most nearly means
a. an eating utensil.
b. a tool.
c. put into practice.
d. a small unit of measurement.

Critical reading is a demanding process. To read critically, you must slow down your reading and, with pencil in hand, perform specific operations on the text. Mark up the text with your reactions, conclusions, and questions. When you read, become an active participant.

9. This paragraph best supports the statement that
a. critical reading is a slow, dull, but essential process.
b. the best critical reading happens at critical times in a person's life.
c. readers should get into the habit of questioning the truth of what they read.
d. critical reading requires thoughtful and careful attention.

10. What does being "an active participant" in reading mean?
a. A good reader will be writing books.
b. A good reader takes notes, asks questions, and draws conclusions.
c. A good book will get an emotional reaction from the reader.
d. Reading out loud is better than reading silently.

It has recently come to the attention of management that employees are using their sick days for purposes of vacation time. Effective June 1, all sick days not used prior to May 31 will be canceled, and all employees will begin to *accrue* new sick time effective June 1. The purpose of this new policy is to *curtail* abuse of employee sick days.

11. The author of this passage most likely believes that employees are
a. underpaid and overworked.
b. highly skilled in their jobs.
c. abusing their job benefits.
d. showing up late for work too often.

12. As used in the passage, *accrue* most nearly means
a. gather together.
b. turn sideways.
c. take time off.
d. report to work.

13. Why is the company restarting sick time beginning June 1?
a. It is the beginning of the company's fiscal year.
b. The company has improved its sick-time benefits.
c. Congress has passed a new law.
d. Employees have been using sick time inappropriately.

14. As used in the passage, *curtail* most nearly
means
  a. an appendage.
  b. increase.
  c. cut back.
  d. leave alone.

If you're a fitness walker, there is no need for a commute to a health club. Your neighborhood can be your health club. You don't need a lot of fancy equipment to get a good workout, either. All you need is a well-designed pair of athletic shoes.

15. This paragraph best supports the statement
that
  a. fitness walking is a better form of exercise
than weight lifting.
  b. a membership in a health club is a poor
investment.
  c. walking outdoors provides a better workout
than walking indoors.
  d. fitness walking is a convenient and valuable
form of exercise.

Part 5: Mathematics Knowledge

Time: 24 minutes

1. What is the area of the following isosceles
triangle?
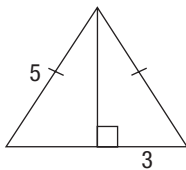
  a. 12 square units
  b. 15 square units
  c. 6 square units
  d. 24 square units

2. Which of the following expressions best
represents the sum of two numbers, *a* and *b*,
divided by a third number, *c*?
  a. $a + b \div c$
  b. $(a + b) \div c$
  c. $a \div (b + c)$
  d. $a \div b + c$

3. A line is drawn within a right angle. One angle
that is formed by the line and the vertex of the
right angle measures 32°. What does the other
angle measure?
  a. 148°
  b. 58°
  c. 328°
  d. 45°

4. Change $\frac{160}{40}$ to a whole number.
  a. 16
  b. 10
  c. 8
  d. 4

5. Which number sentence is true?
  a. $0.43 < 0.043$
  b. $0.0043 > 0.43$
  c. $0.00043 > 0.043$
  d. $0.043 > 0.0043$

6. What is the mean of the following numbers:
76, 34, 78, and 56?
  a. 244
  b. 61
  c. 49
  d. 56

7. Which of the following terms is best described
as *a comparison of two numbers*?
  a. variable
  b. coefficient
  c. ratio
  d. radical

8. An equation of the form $\frac{a}{b} = \frac{d}{c}$ is
  a. an inequality.
  b. a variable.
  c. a proportion.
  d. a monomial.

9. 184 is evenly divisible by
  a. 46
  b. 43
  c. 41
  d. 40

10. The base of a triangle is twice the height of the triangle. If the area is 16 square inches, what is the height?
  a. 4 inches
  b. 8 inches
  c. 12 inches
  d. 16 inches

11. When both six and nine are added to a number, the sum is 49. What is the number?
  a. 15
  b. 34
  c. 43
  d. 21

12. Find the sum of $4x - 7y$ and $7x + 7y$.
  a. $11x$
  b. $14y$
  c. $11x + 14y$
  d. $11x - 14y$

13. What is the sum of the measures of the exterior angles of a regular pentagon?
  a. 72°
  b. 108°
  c. 360°
  d. 540°

14. How many inches are there in $3\frac{1}{3}$ yards?
  a. 126 inches
  b. 120 inches
  c. 160 inches
  d. 168 inches

15. 1 hour 20 minutes + 3 hours 30 minutes =
  a. 4 hours
  b. 4 hours 20 minutes
  c. 4 hours 50 minutes
  d. 5 hours

16. Which of the following is equivalent to $x^3 + 6x$?
  a. $x(x^2 + 6)$
  b. $x(x + 6)$
  c. $x(x^2 + 6x)$
  d. $x^2(x + 6)$

17. What is five and four hundredths written as a decimal?
  a. 0.54
  b. 0.054
  c. 5.4
  d. 5.04

18. The square root of a number is three times four. What is the number?
  a. 100
  b. 121
  c. 144
  d. 169

19. The circumference of a circle is 131.88. Assuming π is 3.14, what is the diameter of the circle?
  a. 42 inches
  b. 44 inches
  c. 46 inches
  d. 48 inches

20. Which of the following is 16% of 789?

    a. 126.24

    b. 12.624

    c. 662.76

    d. 66.276

21. What is the value of x when $y = 8$ and $x = 4 + 6y$?

    a. 48

    b. 52

    c. 24

    d. 36

22. Thirty-five cents is what percent of $1.40?

    a. 25%

    b. 40%

    c. 45%

    d. 105%

23. Find the perimeter of a regular octagon that has sides measuring 13 centimeters each.

    a. 78 centimeters

    b. 91 centimeters

    c. 104 centimeters

    d. 117 centimeters

24. Which of the following decimals has the greatest value?

    a. 8.241

    b. 8.0241

    c. 8.2

    d. 8.2041

25. What is the value of the expression $xy - 6z$, when $x = -3$, $y = 6$, and $z = -5$?

    a. −48

    b. 48

    c. −12

    d. 12

Part 6: Electronics Information

Time: 9 minutes

1. Sources of electromagnetic interference (EMI) can include

    a. an electrical power supply located too close to an audio transmission source.

    b. electrical transmission wires placed too close to digital communications wires.

    c. atmospheric events involving the Earth's magnetic field.

    d. all the above

2. What class of fire would an electrical fire be?

    a. Class A

    b. Class B

    c. Class C

    d. Class D

3. The national standard in the United States for the safe installation of electrical wiring and equipment is the National Electrical Code (NEC). This standard is maintained and modified, as needed, every three years by the

    a. individual state or county governments.

    b. National Fire Protection Association (NFPA).

    c. National Institute for Standards and Technology (NIST).

    d. Environmental Protection Agency (EPA).

4. Which schematic symbol represents a NOR gate?

a.

b.

c.

d.
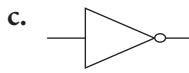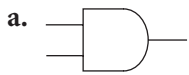
5. Which of the following is not a sensor?
a. a photocell
b. a light-emitting diode
c. a photodiode
d. a phototransistor

6. Microphones convert sound waves into electrical energy. Which type of microphone uses a magnet to convert sound waves to electrical signals?
a. the crystal microphone
b. the condenser microphone
c. the dynamic microphone
d. the fiber optic microphone

7. Which of the following criteria is NOT used to rate speakers?
a. polarity
b. frequency range
c. impedance
d. power

8. What does a hertz measure?
a. the amperage of a device
b. the voltage of a device
c. the decibels of a sound
d. the frequency of a sound wave

9. According to North American electrical standards, what is the standard configuration for ground wire insulation?
a. green wires
b. bare copper wires
c. both **a** and **b**
d. neither **a** nor **b**

10. What type of pliers is depicted here?

a. wire cutting pliers
b. combination pliers
c. needlenose pliers
d. crimping pliers

11. Which of the following is needed to produce electrical power from fossil fuels?
a. a dam
b. a wind turbine
c. tidal forces
d. heat

12. Compressed air can be used to
a. put out a fire.
b. cool solder joints.
c. provide air to breathe in an emergency.
d. blow dust off electric parts.

13. What would probably be the effect of 6–9mA of 60 Hz of AC current on a body?
a. There will be a slight tingling sensation.
b. Pain will be felt but muscle control is still possible.
c. Pain will be felt and muscle control is lost.
d. There will be difficulty breathing.

14. What does the following schematic symbol represent?

   a. a battery
   b. a chassis ground
   c. an earth ground
   d. a signal ground

15. Which of the following will NOT help to minimize static electricity?
   a. wearing cotton clothing
   b. anti-static wrist straps
   c. wearing polyester clothing
   d. anti-static mats

16. Copper electrical wiring is preferable to aluminum electrical wiring because
   a. aluminum heats up and expands more than copper wire.
   b. aluminum cools down and contracts more than copper wire.
   c. aluminum oxidation creates a resistance to the electrical flow.
   d. all the above

17. Which of the following schematic symbols depicts a single on-off switch?
   a.
   b.
   c.
   d.
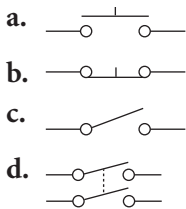
18. If in a schematic's parts list you see "R2: 47 kΩ," what does this indicate?
   a. There are at least two relays and the second one relays 47 kΩ.
   b. There are at least two resistors and the second one handles 47 kΩ.
   c. There are at least two relays that handle a total of 47 kΩ.
   d. There are at least two resistors and combined they handle 47 kΩ.

19. What do the following schematic symbols represent?

   I.
   II.
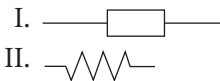
   a. I is a capacitor and II is a resistor.
   b. I is a battery and II is a resistor.
   c. Both are resistors.
   d. I is a capacitor and II is a resistor.

20. In Europe, how is a brown wire used?
   a. Brown wires are not allowed.
   b. It is a ground.
   c. It is neutral.
   d. It is live.

Part 7:
Auto and Shop Information

Time: 11 minutes

1. Neutral (N) position on an automatic transmission indicator means the transmission
   a. is locked and cannot be moved.
   b. is engaged in a maximum load configuration.
   c. has disengaged all gear trains within the transmission.
   d. none of the above

2. What type of mechanical device is used to aid in the cooling of an internal combustion engine?
  a. a pump
  b. a lever
  c. a hinge
  d. a pulley

3. Of the following mechanical devices on an automobile, which one uses friction to accomplish its purpose?
  a. the distributor
  b. the alternator
  c. the brakes
  d. the radiator

4. A pair of gears that convert rotational motion into linear motion in the steering mechanism of an automobile is called
  a. the rack and pinion.
  b. the tap and die.
  c. the flywheel.
  d. the overhead cam.

5. The clutch on an automobile is used to
  a. lock the rear axle.
  b. disconnect the engine from the transmission so that you can shift gears.
  c. connect the universal joint to the transaxle.
  d. connect the drivetrain to the differential.

6. A universal joint
  a. transforms linear motion into stored energy.
  b. can be attached to any rotational object.
  c. transmits rotary motion between two shafts that aren't in a straight line.
  d. converts kinetic energy to potential energy.

7. With the engine off, battery power can be used to
  a. power the catalytic converter.
  b. power the alternator to recharge the battery.
  c. run the power windows.
  d. power the lights and accessories.

8. Which system on an automobile uses shock absorbers?
  a. electrical
  b. suspension
  c. braking
  d. power steering

9. An automobile burns oil when which of the following parts are worn?
  a. the spark plugs
  b. the piston rings
  c. the rocker arms
  d. the connecting rods

10. It is recommended that engine oil in an automobile be changed at what mileage interval?
  a. 1,500 miles
  b. 3,000 miles
  c. 4,500 miles
  d. none of the above

11. A typical 12-volt automobile battery provides
  a. 3 cells.
  b. 6 cells.
  c. 12 cells.
  d. 24 cells.

12. Which automotive system uses universal joints, a driveshaft, and a clutch?
  a. drivetrain
  b. braking
  c. electrical
  d. fuel

13. To measure the inside diameter of a tube, which tool would be best to use?

a.

b.

c.

d.
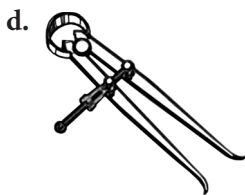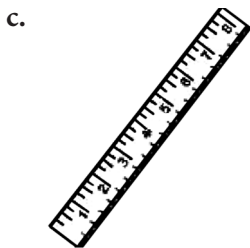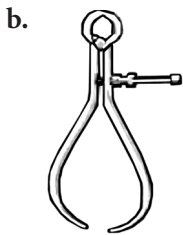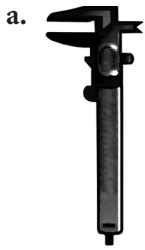
14. A metal punch would be used in sheet metal work to
   a. cut along a scored line.
   b. create 45-degree cuts.
   c. create a curved edge.
   d. make holes in the metal.

15. What saw would be used to cut a hole in Sheetrock for an electrical outlet?
   a. a crosscut saw
   b. a keyhole saw
   c. a hacksaw
   d. a coping saw

16. What would the moisture content be in a piece of lumber with the following stamp?

   a. 12% or less
   b. 15% or less
   c. 19% or less
   d. more than 19%

17. A hacksaw is best used for cutting
   a. intricate patterns in soft wood.
   b. long crosscuts.
   c. iron, steel, and other softer metals.
   d. sheets of plywood.

18. What is the standard size of a claw hammer?
   a. 16 oz.
   b. 24 oz.
   c. 32 oz.
   d. none of the above

19. A nail set is used to
   a. start a nail hole.
   b. drive finish nails below the surface of the surrounding wood.
   c. provide a variety of nails for any circumstance.
   d. none of the above

20. A baluster is a
   a. tool used to shape long pieces of wood.
   b. decorative piece of wood on top of a pole.
   c. one of a set of closely spaced supports on a railing.
   d. guide used for cutting.

21. A *cat's paw* is a type of
a. pry bar.
b. nail remover.
c. multi-utility bar.
d. all the above

22. Which of the following would be the best tool to use to make the most precise angular cuts?
a. a handsaw
b. a coping saw
c. a jigsaw
d. a miter saw

23. Local building codes generally set the minimum diameter for concrete footings at
a. 4 inches.
b. 6 inches.
c. 8 inches.
d. 16 inches.

24. A 2×4 piece of lumber has dimensions that are actually
a. $1\frac{1}{2}'' \times 3\frac{1}{2}''$.
b. $1\frac{3}{4}'' \times 3\frac{3}{4}''$.
c. $2'' \times 4''$.
d. none of the above

25. A carpenter's compass is used to
a. calculate angles.
b. draw circles.
c. estimate distance.
d. determine area.

Part 8:
Mechanical Comprehension

Time: 19 minutes
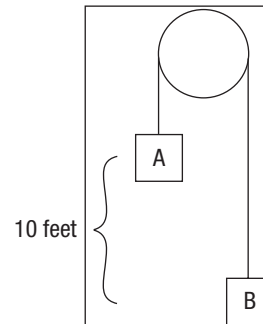
1. Two blocks of equal weight are suspended by a pulley. The blocks are 10 vertical feet apart. How far must block A be pulled down to be at equal height with block B?
a. 5 feet
b. 10 feet
c. 15 feet
d. 20 feet
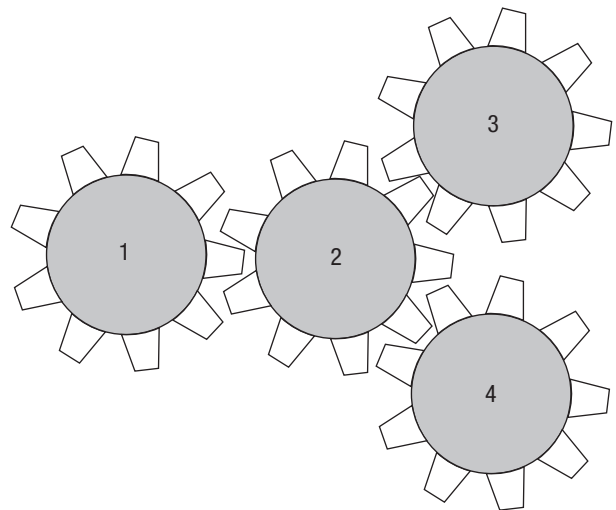
2. If gear 2 turns counterclockwise, which other gear(s), if any, will turn clockwise?
a. 1 only
b. 3 only
c. 3 and 4 only
d. 1, 3, and 4

3. Lenny leaves camp at 6:00 A.M. and jogs north at 8 mph. George leaves camp half an hour later and follows the same path as Lenny at 10 mph. At what time will George catch Lenny?
  a. 7:00 A.M.
  b. 7:30 A.M.
  c. 8:00 A.M.
  d. 8:30 A.M.

60 pounds   *x feet*
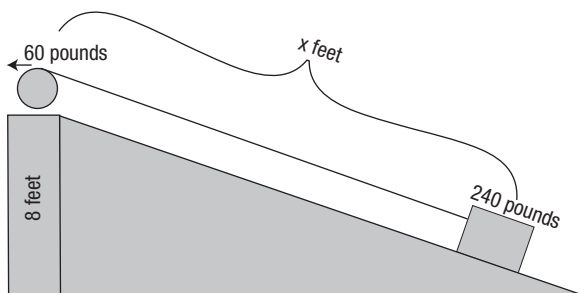
8 feet

240 pounds

4. A 240-pound block is being pulled up an incline by a pulley. The incline rises 8 feet. Neglecting friction, if 60 pounds of force is necessary to move the block up the incline, how long is the incline?
  a. 60 feet
  b. 32 feet
  c. 16 feet
  d. 30 feet
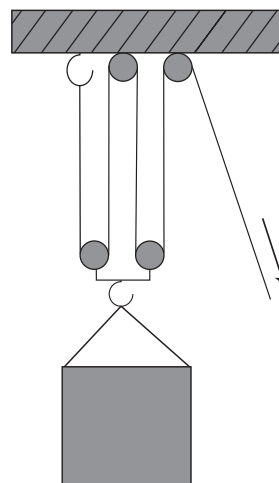
5. What is the mechanical advantage of the pulley system shown here?
  a. 1
  b. 2
  c. 3
  d. 4

200 pounds
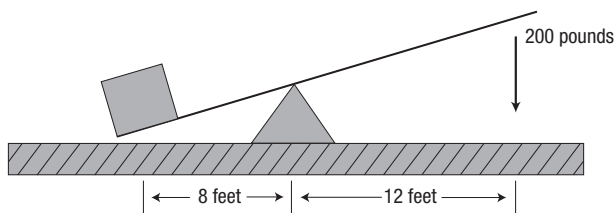
←— 8 feet —→ ←——— 12 feet ———→

**6.** In the diagram, Cory wants to lift a block using a lever. The block is 8 feet from the pivot point and Cory is 12 feet from the pivot point. If it takes 200 pounds of force to lift the block, how much does it weigh?
  a. 96 pounds
  b. 400 pounds
  c. 300 pounds
  d. 200 pounds

7. The same type of plastic is used to make blocks of 3 cubes of different sizes. The first has a weight of 0.5 pounds, the second has a weight of 0.75 pounds, and the third has a weight of 1.5 pounds. Which of the following statements is true?
   a. All three cubes will either float or sink.
   b. Cube 1 will float and cubes 2 and 3 will sink.
   c. Cube 3 will float and cubes 1 and 2 will sink.
   d. Cubes 1 and 2 will float and cube 3 will sink.
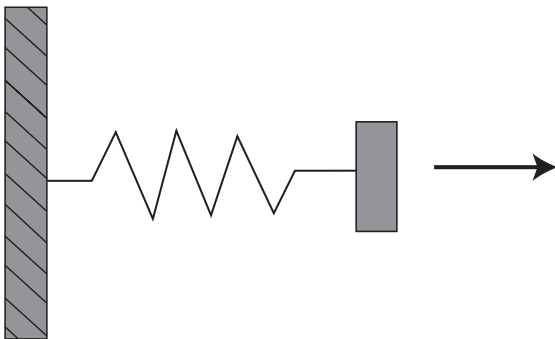
8. A force of 8 pounds is required to move a spring 4 inches. How much force is required to move the spring 1 foot?
   a. 3 pounds
   b. 12 pounds
   c. 24 pounds
   d. 36 pounds

9. A screw has 7 threads per inch. How many full turns are necessary for the nut to travel 3 inches?
   a. 12 turns
   b. 15 turns
   c. 18 turns
   d. 21 turns

10. Why is oil added to an engine?
   a. Engines burn oil.
   b. Oil helps gasoline burn better.
   c. Oil increases friction in the engine.
   d. Oil decreases friction in the engine.
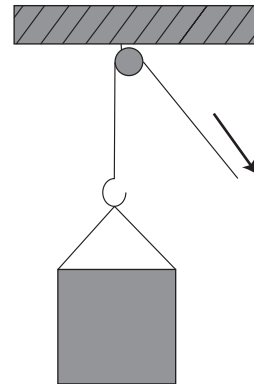
11. Using the pulley system shown, how much force is required to lift an 80-pound weight?
   a. 20 pounds
   b. 40 pounds
   c. 80 pounds
   d. 160 pounds

12. Raising a flag up a flagpole is most commonly accomplished with what simple machine?
   a. a lever
   b. a pulley
   c. an inclined plane
   d. a gear
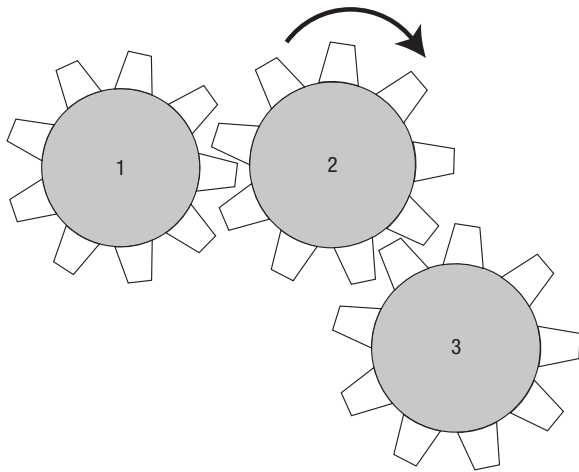
13. If gear 2 turns clockwise, which other gear(s), if any, will turn clockwise?
   a. 1 only
   b. 3 only
   c. 1 and 3
   d. none
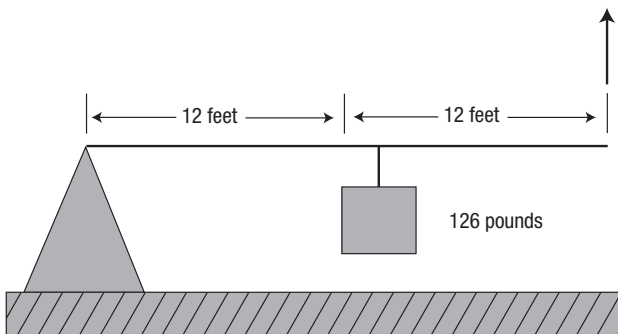
14. In the diagram, Andre wants to lift a 126-pound block using a lever. If the block is 12 feet from the pivot point and Andre is 12 feet beyond that, how much force must he apply to lift the block?
   a. 126 pounds
   b. 63 pounds
   c. 75 pounds
   d. 144 pounds
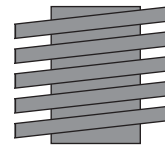
15. The shock absorber on a car is a very large spring. If a car hits a pothole with 500 pounds of force and the shock absorber compresses 2.5 inches, what is its force constant?
   a. 200 pounds per inch
   b. 300 pounds per inch
   c. 350 pounds per inch
   d. 400 pounds per inch
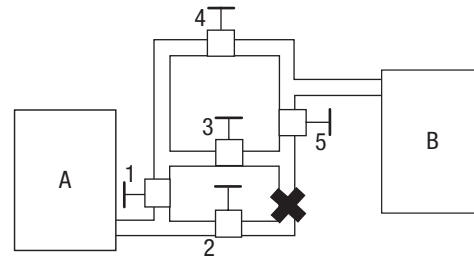
16. A cracked pipe, marked in the figure by an ×, has caused all valves to automatically close. Which valves can be opened to allow water to flow from tank A to tank B while avoiding the broken section?
   a. 1 and 3
   b. 1 and 4
   c. 1, 2, and 5
   d. 1, 3, and 5
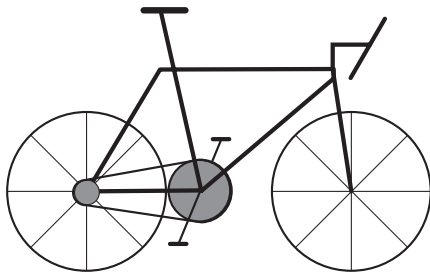
17. A single-speed bicycle has a front gear with 48 teeth and a rear gear with 12 teeth. If the bicycle is pedaled at 90 rpm, how fast will the rear wheel rotate?
- **a.** 90 rpm
- **b.** 180 rpm
- **c.** 270 rpm
- **d.** 360 rpm
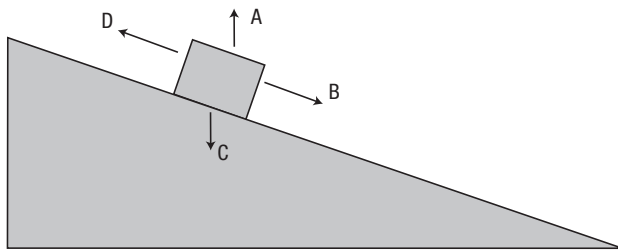
18. A block is held in place on a ramp by friction. Which arrow shows the direction of the frictional force?
- **a.** A
- **b.** B
- **c.** C
- **d.** D

19. If the following items are placed into a hot oven, which will warm most quickly?
- **a.** a metal fork
- **b.** a plastic spoon
- **c.** a ceramic mug
- **d.** a glass bowl
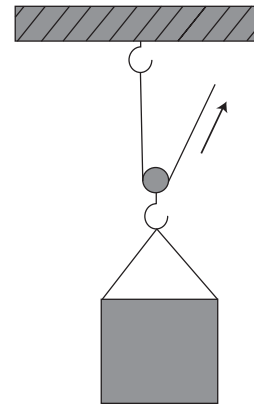
20. Using the pulley system shown in the figure, how much force is required to lift a 300-pound weight?
- **a.** 75 pounds
- **b.** 100 pounds
- **c.** 150 pounds
- **d.** 300 pounds

21. A screw can be thought of as a special type of what simple machine?
- **a.** the lever
- **b.** the inclined plane
- **c.** the pulley
- **d.** the wheel and axle
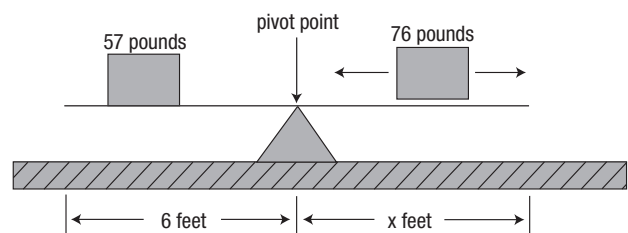
22. In the diagram, Steven wants to balance two blocks on either side of a lever. One block weighs 57 pounds and the other weighs 76 pounds. If the 57-pound block is 6 feet to the left of the pivot point, how far to the right of the pivot point should the 76-pound block be placed?
- **a.** 4.5 feet
- **b.** 6 feet
- **c.** 19 feet
- **d.** 4 feet
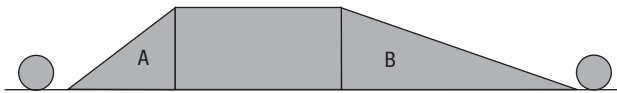
23. Two ramps can be used to raise a heavy barrel up to a platform. Neglecting friction, which ramp requires less work to raise the barrel?
  a. Ramp A requires less work.
  b. Ramp B requires less work.
  c. They require the same amount of work.
  d. It is impossible to determine.
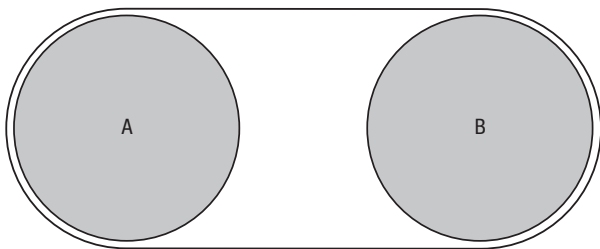
24. Pulleys A and B are identical in size and connected by a belt. If pulley A rotates at 20 rpm clockwise, at what rate and in what direction will pulley B rotate?
  a. 20 rpm, clockwise
  b. 20 rpm, counterclockwise
  c. 40 rpm, clockwise
  d. 40 rpm, counterclockwise
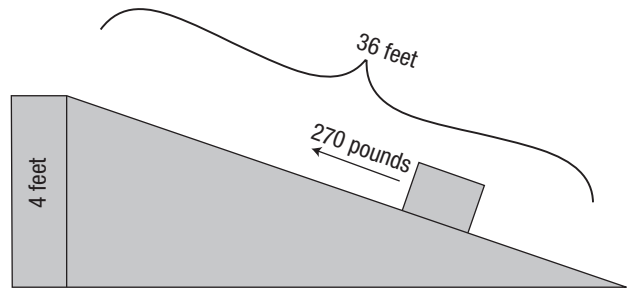
25. A 270-pound block is being pulled up an incline by a pulley. The incline is 36 feet long and rises 4 feet. Neglecting friction, how much force is necessary to move the block up the incline?
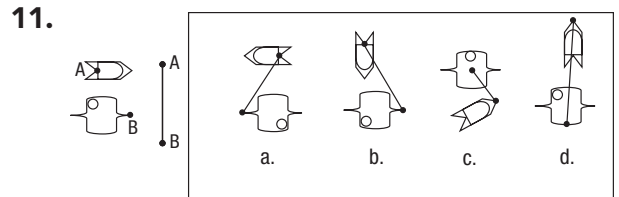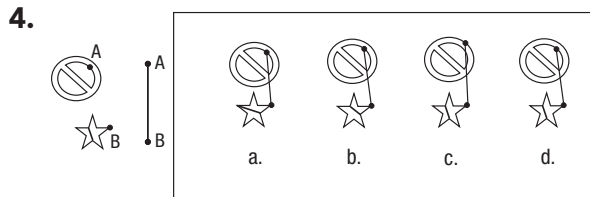 **a.** 30 pounds
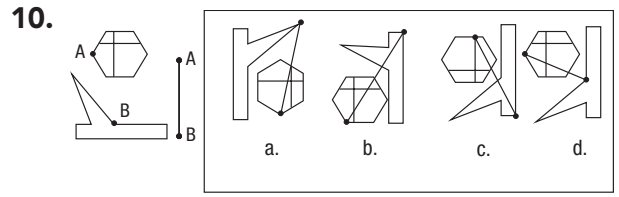 **b.** 270 pounds
  c. 40 pounds
  d. 144 pounds
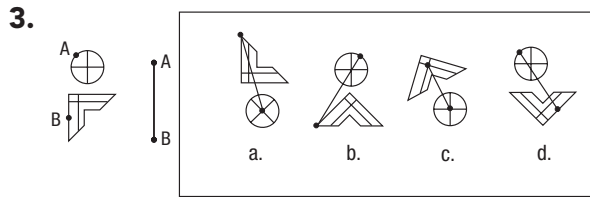
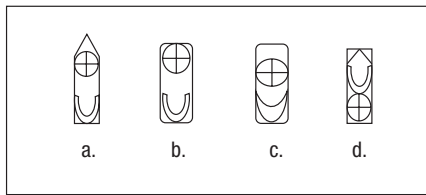# Part 9: Assembling Objects

Time: 15 minutes

Each question is composed of five separate drawings. The problem is presented in the first drawing, and the remaining four drawings are possible solutions. Determine which of the four choices contains all of the pieces assembled properly that are shown in the first picture. Note: images are not drawn to scale.

1.

2.

3.

a.   b.   c.   d.

4.

a.   b.   c.   d.

5.

a.   b.   c.   d.

6.

a.   b.   c.   d.

7.

a.   b.   c.   d.

8.

a.   b.   c.   d.

9.

a.   b.   c.   d.

10.

a.   b.   c.   d.

11.

a.   b.   c.   d.

12.

a.   b.   c.   d.

13.

a.   b.   c.   d.

14.

a.   b.   c.   d.

15.

a.   b.   c.   d.

16.

a.   b.   c.   d.
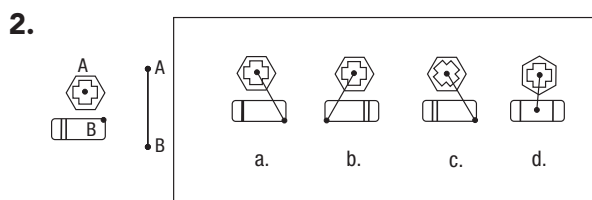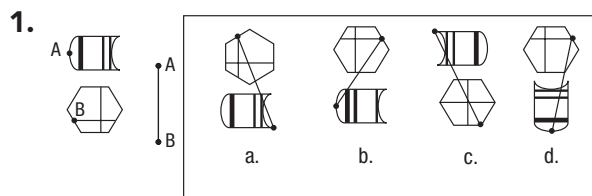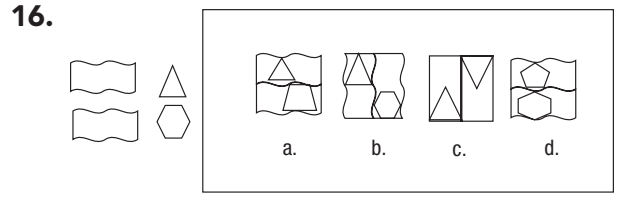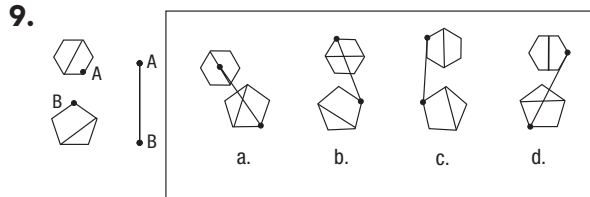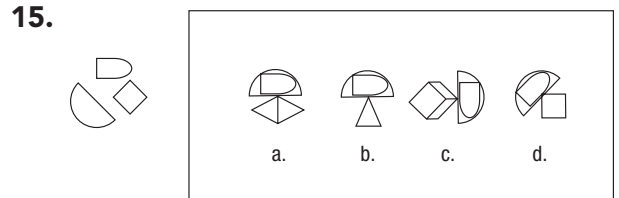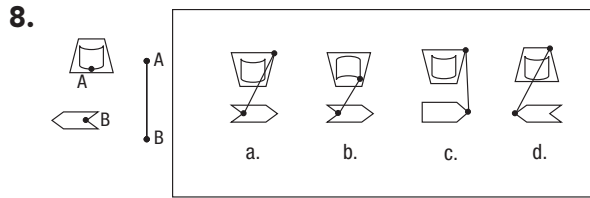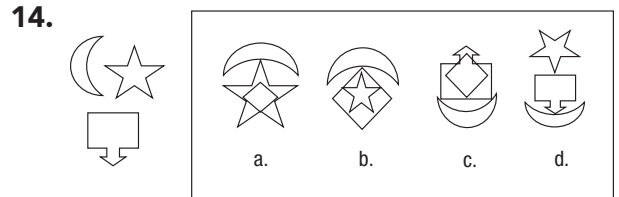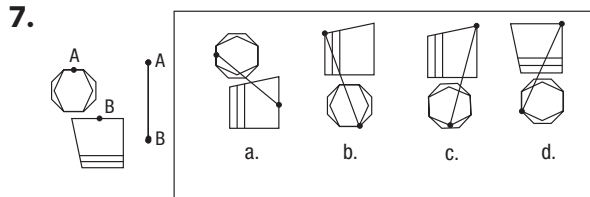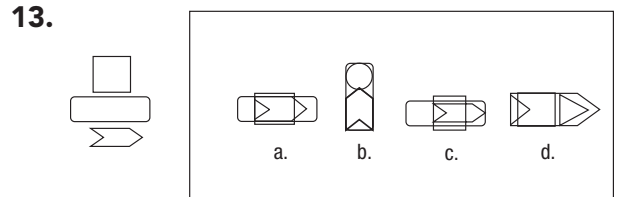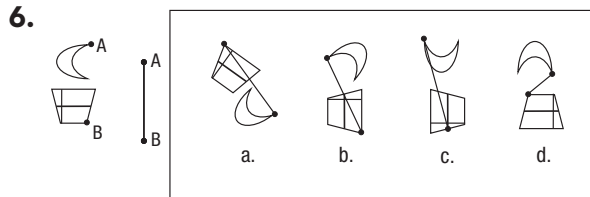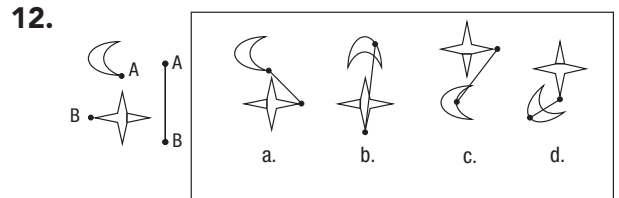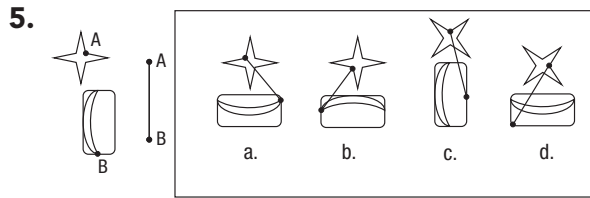
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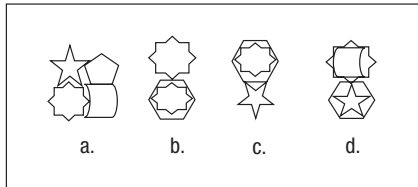
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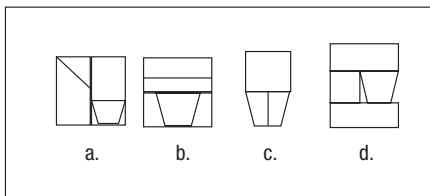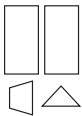
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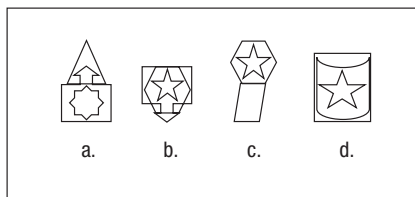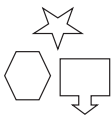
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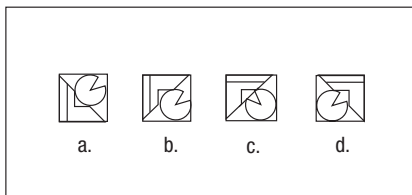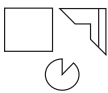
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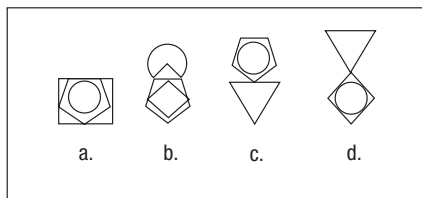
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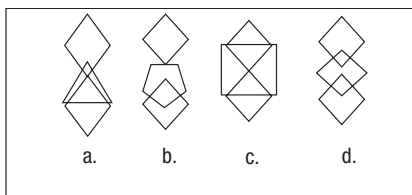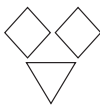
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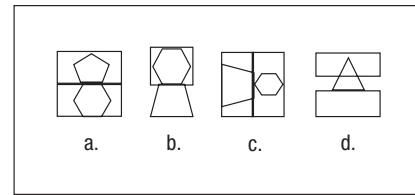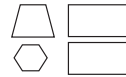
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Scoring

Write your raw score (the number you got right) for each test in the blanks below. Then turn to Chapter 2 to find out how to convert these raw scores into the scores the armed services use.

1. General Science: _____ right out of 25
2. Arithmetic Reasoning: _____ right out of 30
3. Word Knowledge: _____ right out of 35
4. Paragraph Comprehension: _____ right out of 15
5. Mathematics Knowledge: _____ right out of 25
6. Electronics Information: _____ right out of 20
7. Auto and Shop Information: _____ right out of 25
8. Mechanical Comprehension: _____ right out of 25
9. Assembling Objects: _____ right out of 25

Answers

Part 1: General Science

1. a. Krypton (Kr) is a noble gas found in the last column of the periodic table. These elements have complete outer valence shells, making them very unreactive to other elements.

2. a. When a Moon is new it is between the Sun and Earth. A solar eclipse occurs when the Moon crosses the path of the Sun's light rays between the Earth and Sun, which can happen only during the new Moon phase.

3. c. The mass number of an atom is the sum of protons and neutrons. In this case, $60 + 75 = 135$.

4. d. The urinary bladder stores urine after it is created in the kidneys.

5. d. A mitochondrion in a cell produces energy for cellular functions through processing ATP.

6. a. The alkaline earth metals are in group 2, which all have a valence electron configuration of s^2.

7. c. Active transport requires energy to transport substances through the membrane. Diffusion and osmosis rely on concentration differences, and filtration relies on pressure differences.

8. a. According to the balanced reaction, 3 moles of O_2 in the reactants is equivalent to 3 moles of Cu_2O in the products. Therefore, to make 24 moles Cu_2O, 24 moles of O_2 are needed.

9. d. In the food chain green plants "produce" energy through photosynthesis, which is transferred to consumers—first plant eaters, then animal eaters.

10. d. Partial pressure of each component is proportional to its molar ratio of the mixture. Using the mass and molecular weights given, there are 0.5 mol oxygen ($8 \text{ g} \times \frac{1 \text{ mol}}{16 \text{ g}} = 0.5$ mol) and 1 mol nitrogen ($14 \text{ g} \times \frac{1 \text{ mol}}{14 \text{ g}} = 1.0$ mol). Therefore, the molar ratio of oxygen in this mixture is $\frac{0.5}{0.5 + 1.0} = \frac{0.5}{1.5} = \frac{1}{3}$ and oxygen's partial pressure is $\frac{1}{3} \times 750$ mm Hg = 250 mm Hg.

11. a. Membranes are not rigid and do not provide support like cell walls do. The cell membrane is responsible for transporting substances and forming structures to contain cytoplasm and DNA.

12. d. Nuclear fusion is the combining of smaller nuclei to form a larger one. This reaction releases extremely large amounts of energy and is the reaction occurring at the Sun and other stars.

13. a. Mountains that are not volcanic are formed at a continental collision zone.

14. c. The time for a radioactive element to lose half its atoms is referred to as its radioactive period. Be careful not to confuse this with half-life, which is the time it takes for the concentration of a sample of nuclei to decompose by one half.

15. b. Bacteria are a part of the kingdom *monera*, the classification for the simplest single cell life.

16. d. Use Gay-Lussac's law, $P_1 T_1 = P_2 T_2$. Don't forget to convert temperature from Celsius to Kelvin by adding 273. $\frac{(400 \text{ K})(6 \text{ atm})}{300 \text{ K}} = 8$ atm

17. c. Fermentation is a process that produces energy without oxygen.

18. b. 1 atm is equal to 760 mm Hg. Since 740 mm Hg is just a little bit less than 760 mm Hg, the answer should be just a little less than 1 atm.

19. a. Fungi and plants evolved from protists. Some protists are autotrophs and contain chloroplasts like plants. Fungi are not autotrophic. Protists do not have specialized tissue.

20. c. When two elements form an ionic compound, the charge of the ion needs to be determined. Aluminum (Al) has three valence electrons and will give those up, while oxygen (O) has six valence electrons, so it favors taking two electrons in. This gives the Al ion a +3 charge and the O ion a –2 charge. The number of ions in the ionic compound is determined by balancing the overall charge. In this case, two Al ions will give a charge of +6, which will be balanced by three O ions with a total charge of –6.

21. d. Meiosis results in four haploid gametes with half the number of chromosomes as their parent. This is unlike mitosis that results in two daughter cells with the same number of chromosomes as their parent.

22. b. Weather and almost all clouds are located in the troposphere.

23. c. Covalent molecules are named using prefixes to describe the number of atoms and generally end in the suffix *-ide*. In this case, *tetra-* represents four chlorine atoms.

24. a. After 18 minutes, three half-life cycles have occurred.
$$\left(\frac{1}{2}\right)^3 = \frac{1}{8}$$
unknown mass $\cdot \frac{1}{8} = 40$ g $\Rightarrow$ unknown mass = 320 g

25. d. Viruses are unable to reproduce because they lack cells. Viruses rely on host cells to express their genetic material. Viruses contain enzymes and nucleic acid, and have evolved through natural selection similar to other living organisms, but are still considered nonliving because they lack cellular reproduction.

Part 2: Arithmetic Reasoning

1. c. If the number of points is increased by 25%, the number of points in his senior year is 125% of the number of points in his junior year (100% + 25% = 125%). To find 125% of the number of points in his junior year, multiply the junior year points by the decimal equivalent of 125%; $260 \times 1.25 = 325$. If you chose **a**, you calculated what his points would be if he scored 25% *less* than he did in his junior year.

2. c. This is a subtraction problem. First, simplify the problem by dropping the word *million*. The problem then becomes P = 3,666 and M = 36. So P – M = 3,666 – 36 = 3,630. Now add back the word *million*, and the answer becomes 3,630 million.

3. c. This is a three-step problem involving multiplication and division. First, change yards to feet: 240 yards × 3 feet in a yard = 720 feet. Now find the number of square feet in the parcel: 121 feet × 740 feet = 87,120 square feet. Now find the number of acres: 87,120 square feet ÷ 43,560 square feet in an acre = 2 acres.

4. c. First, find the total hours worked by all six nurses: 8 + 10 + 9 + 8 + 7 + 12 = 54. Then find the average by dividing the total hours by the number of nurses: 54 ÷ 6 = 9.

5. d. The production for Lubbock is equal to the total minus the other productions: 1,780 – 450 – 425 – 345 = 560.

6. c. First, simplify the problem: L = $5 + $4 + $6 = $15; R = $14. Lucinda spent the most by $1. Don't forget that only the popcorn was shared; the other items must be multiplied by two.

7. c. This is a multistep problem. First, figure out how many dozen eggs John's chickens produce per day: 480 ÷ 12 = 40 dozen eggs per day. Now figure out how much money John makes on eggs per day: $2 × 40 = $80 per day. Finally, figure out how much money John makes per week: $80 × 7 = $560 per week. The most common mistake for this problem is to forget to do the last step. It is important to read each problem carefully, so you won't skip a step.

8. c. To find the hourly wage, divide the total salary by the number of hours worked, or 331.01 divided by $39\frac{1}{2}$, or 39.5, which equals 8.38.

9. c. There are two glasses out of eight left to drink, or $\frac{2}{8}$, which reduces to $\frac{1}{4}$.

10. d. Multiply the number of years in a decade by the given number of decades. A decade is ten years. Eight decades is therefore 80 years: 8 × 10 years = 80 years.

11. b. If it is 11:46 A.M., in 14 minutes it will be noon. In 15 minutes, then, it will be 12:01 P.M.

12. c. This is a multiplication problem. To multiply a whole number by a mixed number, first convert the mixed number to a fraction: $1\frac{2}{5} = \frac{7}{5}$. Then, multiply: $\frac{7}{5} \times \frac{3}{1} = \frac{21}{5}$. Now reduce: $\frac{21}{5} = 4\frac{1}{5}$.

13. c. First, convert tons to pounds; 1 ton = 2,000 pounds; 36 tons (per year) = 72,000 pounds (per year); 1 year = 12 months, so the average number of pounds of mosquitoes the colony of bats can consume in a month is 72,000 ÷ 12, or 6,000 pounds.

14. a. This is a subtraction of mixed numbers problem. The common denominator is 8. Convert $\frac{1}{2}$ to $\frac{4}{8}$. Because $\frac{4}{8}$ is larger than $\frac{1}{8}$, you must borrow from the whole number 23. Then subtract: $22\frac{9}{8} - 6\frac{4}{8} = 16\frac{5}{8}$.

15. b. $\frac{1}{2}$ of $\frac{1}{4}$ is expressed as $\frac{1}{2} \times \frac{1}{4}$ or $\frac{1}{8}$.

16. b. The number 54 divided by 6 is 9.

17. b. First, change the percent to a decimal: $3\frac{1}{4}\%$ = 0.0325. Now multiply: 30,600 × 0.0325 = 994.5. Finally, add: $30,600 + 994.50 = $31,594.50 for Yetta's current salary.

18. c. Multiply $115 by 12 because there are 12 months in a year; $115 × 12 = $1,380 per year.

19. d. This is a two-step multiplication problem. First, multiply: 5 × 2 = 10, which is the number of trips Jacqueline drives to get to work and back. Then multiply 19.85 by 10 by simply moving the decimal one place to the right.

20. b. Add the amount of miles for each day for a total of 696 miles; 696 rounded to the nearest ten or nearest hundred is 700.

21. c. First ask how many inches are in one foot; the answer is 12 inches. Now multiply: 12 × 4 = 48 inches.

22. d. First, find the number of degrees that the temperature will increase; 57° − 53° = 4°. Since the temperature increases 1° every two hours, 4° × 2 hours is 8 hours. Add eight hours to 5 A.M. It will be 1:00 P.M.

23. d. First, calculate the number of students that do not participate in extracurricular activities: 360 − 150 = 210 students. Next, find the percent 210 is of 360 by setting up the proportion $\frac{210}{360} = \frac{x}{100}$. Cross multiply to get $360x = 21,000$. Divide each side of the equation by 360 to get $x = 58.33$, which rounds to 58%.

24. d. If four students are lining up, then there are four choices of students for the first spot in line, three choices for the second, two choices for the third, and one choice for the fourth spot. The counting principle tells you to take the possible choices and multiply them together: 4 × 3 × 2 × 1 = 24. This type of situation is also called a *permutation*, because the order matters.

25. d. To subtract, convert to improper fractions, find a common denominator, and subtract the numerators: $1\frac{1}{2} - \frac{10}{3} = \frac{33}{6} - \frac{20}{6} = \frac{13}{6}$ or $2\frac{1}{6}$.

26. c. He spent $54 on pants ($3 \times \$18 = \$54$) and $120 on shirts ($5 \times \$24 = \$120$). Altogether he spent $174 ($54 + $120 = $174). If you chose **a**, you calculated the cost of *one* pair of pants plus *one* shirt instead of *three* pairs of pants and *five* shirts.

27. c. Divide 405 by 45 to get 9 minutes.

28. a. The school record is less than Brian's time. Therefore, 2.68 must be subtracted from 13.4; 13.4 – 2.68 = 10.72. To subtract decimals, line up the numbers vertically so that the numbers are aligned. Since 13.4 has one less decimal place than 2.68, you must add a zero after the 4 (13.40) before subtracting. After you have done this, subtract normally. If you chose **d**, you added instead of subtracted.

29. d. If Jason's price is $\frac{3}{4}$ of Lisa's, that would mean that if $63 is divided by 3, the quotient will be $\frac{1}{4}$. Add this to Jason's price, and the sum is Lisa's price: $63 ÷ 3 = $21; $63 + $21 = $84. Lisa's salon charges $84.

30. c. Each quarter is worth $0.25, so two quarters are equal to $0.50 ($2 \times 0.25 = 0.50$). Each dime is worth $0.10: $0.50 ÷ $0.10 = 5 dimes.

Part 3: Word Knowledge

1. a. To *glare* means to stare angrily; to *scowl* means to have an angry expression.

2. c. One meaning of *civil* is involving the general public.

3. c. A *peer* is a person belonging to the same group; a *fellow* is an equal in rank, or a member of the same group.

4. b. A *fiasco* is a complete failure, or a disaster.

5. a. A *chasm* is a deep split in the earth, or a gorge.

6. c. *Expertise* and mastery both mean special skills or knowledge.

7. b. *Outlandish* means extremely out of the ordinary; *absurd* means ridiculously unreasonable.

8. d. To *pine* means to long for, or to crave.

9. b. To *exploit* means to use selfishly for one's own ends, to misuse or abuse.

10. a. *Culmination* means the act of reaching the highest point, or decisive action; *realization* means the act of bringing into concrete existence.

11. c. To *feign* means to assert as if true, or to pretend.

12. b. To *heed* means to pay attention to, or to consider.

13. a. To *edge* means to force or move gradually (as in to edge off the road).

14. d. To *elevate* means to lift up, or raise; to *hoist* means to raise into position.

15. c. To *appoint* means to name officially, often to a position; to *nominate* means to appoint or propose for office.

16. a. To *hoard* means to gather a hidden supply; to *stockpile* means accumulate a reserve of something.

17. c. A *hub* is a center of activity.

18. d. *Tame* means deficient in spirit or courage, or submissive.

19. b. To *irk* means to annoy or irritate.

20. c. To *loom* means to come into sight in enlarged or distorted form; to *surface* means to come to the surface or into view.

21. a. *Fitful* means having intermittent or irregular character; *erratic* means lacking regularity.

22. d. *Gaudy* means ostentatiously or tastelessly ornamented; *flashy* means ostentatious or showy.

23. b. To *flaunt* means to display ostentatiously or impudently; to *parade* means to exhibit ostentatiously.

24. a. To *flex* means to bend.

25. d. To *tantalize* means to tease by presenting something desirable.

26. a. The phrase *even though she's almost 80* indicates that the correct answer will seem contrary to what we would normally think of as being a quality of an elderly person. Therefore, choices **c** and **d** are incorrect. Choice **b**, *persistent*, is a possibility, but there is a better answer choice—choice **a**, *indefatigable*, meaning "untiring."

27. a. A treasure hunter would most likely be interest by a glimmer of gold, so choices **c** and **d** do not make sense. Answer choice **b** is almost correct, but the best word is choice **a**, *piqued*, which means aroused or excited.

28. b. It makes the most sense that a *novice*, or new, doctor would be overwhelmed by the amount of work required.

29. b. Although desert dwellers might be classified as any of these words, the sentence is really looking for a word describing people who are constantly moving—the word that best fits his definition is choice **b**, *nomadic*.

30. a. The implication is that Mr. Crane might harm his chances of being hired if he divulged the previous firing; therefore, the best answer is choice **a**, *jeopardize*, meaning "endanger."

31. a. Although all four choices fit the sentence, the only word that explains why Carlos would continue to feel immersed in the film's world is engrossing.

32. d. An anti-authoritarian philosopher would hold views that were against the king, so choices **a** and **b** are incorrect. Although choice **c** could make sense, it is more likely that a furious king would call for the philosopher to be ostracized.

33. c. The keyword *but* indicates that the second half of the sentence should provide evidence against the first half. If the task of climbing the mountain is daunting, then the second half should say something that suggests otherwise. Therefore the best choice is *insurmountable*, meaning incapable of being overcome or achieved. In this case, *not insurmountable* would mean still possible.

34. d. A pacifist is someone who refuses to engage in violence; therefore the best answer is *deplore*, meaning "hate."

35. d. The correct answer choice would explain what an army would do to an invading force if it were to charge them; of the four choices, *repel* most accurately fits the sentence.

Part 4: Paragraph Comprehension

1. b. The passage states that all machines are based on six simple machines, and it goes into detail to explain the principles of simple machines and give examples of each type. The other choices might refer to details in the passage, but only choice **b** states the overall theme.

2. c. The passage states that most machines use one or more of the six basic simple machines to operate. Cars are listed among the complicated machines that we use daily, so we can infer that it uses simple machines to operate.

3. b. Each of the choices is listed as a simple machine in the passage except for a pushbutton.

4. d. The word *myriad* means "a very large, indefinite number." Therefore, many is the best choice.

5. c. The mayor stated in the last sentence of the first paragraph that the vandalism was being caused by students from a rival high school.

6. a. The word *transient* refers to someone or something that will not remain in one place for very long. Thus, a transient person is just "passing through" town.

7. b. The first sentence of the second paragraph states that the town council will meet again on the 3rd of next month.

8. c. When *implement* is used as a verb, it means "to put something into practice." When it is used as a noun, it can refer to a tool or even an eating utensil, so you need to determine from the context whether it is being used as a noun or a verb. In this passage, it is used as a verb, a word that describes some form of action.

9. d. This answer is implied by the whole paragraph. The author stresses the need to read critically by performing operations on the text in a slow and specific manner. Choice **a** is incorrect because the author never says that reading is dull. Choices **b** and **c** are not supported by the paragraph.

10. b. The passage urges the reader to mark up the text, ask questions, and draw conclusions, which is what is meant by being *an active participant*. The other options may or may not be true, but they are not addressed in the passage.

11. c. In the first sentence, the passage states that employees have been abusing their sick-time benefits in order to increase their vacation time. The writer's tone makes it clear that he or she does not approve of the practice, particularly since he or she refers to it as an "abuse" in the last sentence.

12. a. The word *accrue* means to gather together or to collect.

13. d. The new policy beginning June 1 is designed, according to the passage, to discourage employees from misusing their sick-time benefits.

14. c. The word *curtail* means to cut back on something or to decrease something. To curtail abuse means to cut back on or decrease how much abuse is taking place.

15. d. The author stresses the convenience of fitness walking by stating that it does not require a commute to a health club. The paragraph also implies that fitness walking will result in a good workout. Choice **a** is incorrect because no comparison to weight lifting is made. Choice **b** may seem like a logical answer, but the paragraph only refers to people who are fitness walkers, so for others, a health club might be a good investment. Choice **c** is not in the passage.

Part 5: Mathematics Knowledge

1. a. *Area* $= \frac{1}{2}(b \times h)$. To get the height of the triangle, use the Pythagorean theorem: $3^2 + height^2 = 5^2$, so height $= 4$. When this is plugged into the area equation, you'll get an area of 6 square units for half of the triangle. Double this, and the answer is 12 square units.

2. b. Break the statement down into smaller parts. The first part, "the sum of two numbers, *a* and *b*," can be translated $(a + b)$. This part needs to be in parentheses to ensure that the correct order of operations is executed. The second part, "divided by a third number, *c*," takes the first part and divides it by *c*. This now becomes $(a + b) \div c$.

3. b. The line right, or 90°, angle is split into two complementary angles. The given angle is 32°; therefore, $90 - 32 = 58°$.

4. d. Divide the top number by the bottom number: $160 \div 40 = 4$.

5. d. The farther to the right the nonzero digits are, the smaller the number. Forty-three thousandths is greater than 43 ten-thousandths.

6. b. Add the four numbers together for a sum of 244. Then, divide by 4 to get a quotient of 61.

7. c. A ratio is a comparison of two numbers.

8. c. This equation is a proportion, expressing the equivalence of two ratios.

9. a. Forty-six goes into 184 four times. The other choices cannot be divided evenly into 184.

10. a. The area of a triangle is $A = \frac{1}{2}(b \times h)$. Since $b = 2h$, you have $16 = \frac{1}{2}(2h)(h)$ or $h^2 = 16$; $h = 4$ inches.

11. b. Subtract both 6 and 9 from 49. The correct answer is 34.

12. a. Only like terms can be added: $4x - 7y + 7x + 7y$; $4x + 7x$ and $-7y + 7y$. The y terms cancel each other out, leaving $11x$ as the correct answer.

13. c. The sum of the measures of the exterior angles of any convex polygon is 360°.

14. b. To solve this problem, you must first convert yards to inches. There are 36 inches in one yard; $36 \times 3\frac{1}{3} = \frac{36}{1} \times \frac{10}{3} = \frac{360}{3} = 120$.

15. c. Add the hours first, and then the minutes: 1 hour + 3 hours = 4 hours. 20 minutes + 30 minutes = 50 minutes. Combine: 4 hours 50 minutes.

16. a. The correct answer is $x(x^2 + 6)$.

17. d. This is a mixed decimal, which included a whole number placed to the left of the decimal point. The zero is in the tenths place and the 4 is in the hundredths place: 5.04.

18. c. First, find the product of the given values, which is 12. Then, square that number. Twelve squared equals 144. The correct answer is 144.

19. a. Divide the circumference by 3.14 to find the diameter; therefore, the correct answer is 42 inches.

20. a. The correct answer is 126.24.

21. b. Substitute 8 for y in the expression and perform the operations: $x = 4 + 6(8)$; $x = 52$.

22. a. Simply set up the equation in the manner in which the problem is written. Since $x\% = \frac{x}{100}$, the equation is $\frac{x}{100} = \frac{35}{1.40}$. Cross multiply: $1.40x = (0.35)(100)$. Simplify: $x = \frac{35}{1.40}$. Thus, $x = 25$, which means \$0.35 is 25% of \$1.40.

23. c. A regular octagon has eight equal sides; therefore, the perimeter equals 8×13. The correct answer is 104 centimeters.

24. a. The greatest value to the right of the decimal point can be determined by the tenths place. Choices **a**, **c**, and **d** all have a two in the tenths place. Choice **a** is correct because its values in the hundredths and thousandths places are greater than the other two possible answers.

25. d. When the given values are plugged into the expression, it reads: $(-3)(6) - 6(-5)$; $-18 + 30 = 12$.

Part 6: Electronics Information

1. d. Electromagnetic interference (EMI) is electromagnetic energy that adversely affects the performance of electrical/ electronic equipment by affecting the performance and operation of the equipment in various degrees to the point of failure.

2. c. Class C fires are those that consist of energized electrical equipment. Class A fires are combustible solid materials and Class B fires are flammable liquids. Class D fires involve combustible metals. If electrical power is shut off in a Class C fire, it then becomes a Class A, B, or D fire depending on what remains aflame.

3. b. The National Fire Protection Association (NFPA), while not a federal agency, first established the National Electrical Code (NEC) in 1897, and its incorporation as a national standard has been mandated and/or adopted by all 50 states.

4. d. This is the component symbol for a NOR gate. Choice **a** is the symbol for an AND gate, choice **b** for an OR gate, and choice **c** represents a NOT gate.

5. b. A light emitting diode (LED) emits light, whereas the others receive or sense light.

6. c. Dynamic microphones use electromagnetic induction to produce sound waves. Crystal microphones (**a**) use piezoelectricity; condenser microphones (**b**) use a capacitor; fiber optic microphones (**d**) use a laser.

7. a. A speaker converts electrical signals to sound waves. Of the choices, only polarity is not a speaker rating.

8. d. Hertz is a term used to measure the frequency of a sound wave. It is also known as cycles per second and abbreviated as Hz.

9. c. Green wires and bare copper wires are used only for grounding. These wires will ensure the appliance is grounded and should be attached from the junction boxes to the appliance receiving power.

10. a. Wire cutters are one of the electrician's most important tools.

11. d. Producing electrical power from fossil fuels such as oil, coal, or natural gas requires heat to release the hydrocarbon energy held within the fuel. A dam uses stored water from a reservoir or tidal movement to generate electricity through the hydroelectric process while a wind turbine generates electricity through the rotational motion of the turbine.

12. d. You should use compressed air for parts that are too delicate to dust with cloth.

13. b. A current of .3 – .4 mA will produce a slight tingling sensation; a current of 10 – 16 mA will cause pain; and will prevent muscles from responding, causing you to not be able to break the connection; and 15 – 23 mA will cause difficulty breathing. A current of 65 – 100 mA will cause heart fibrillation.

14. d. This is the schematic symbol for a signal ground.

15. c. Synthetic materials such as polyester generate a great deal of static electricity due to the triboelectric effect of the fibers rubbing against one another and skin. Cotton (**a**) is predominantly a low-static material. Anti-static devices such as wrist bands (**d**) and mats (**c**) do much to minimize static electricity.

16. d. When aluminum wiring warms up from the passage of electricity, it expands more than copper does; when it cools down, it contracts more than copper does. This expansion and contraction, over time, can cause the loosening of attachment screws, creating a potential fire hazard. Aluminum oxidation (corrosion when exposed to oxygen) develops as a resistor, causing additional heat, creating additional concerns of a fire hazard.

17. c. Choice **a** is a push switch, choice **b** is a push-to-break switch, and choice **d** is a dual on-off switch.

18. b. The R indicates the part is a resistor and the 2 indicates it is the second out of at least 2 resistors in the schematic. The 47 kΩ is the amount of resistance of the individual resistor.

19. c. The symbol with the rectangle is used in the EU for resistors whereas the zigzag symbol is used in the United States.

20. d. In Europe, brown wires are live wires. The neutral (**c**) wire is blue and the ground (**b**) is green and yellow.

Part 7: Auto and Shop Information

1. c. The neutral (N) position setting disengages all gear trains within the transmission, meaning the transmission is disconnected from the drivetrain. The automobile can be towed in this configuration and is one of the two positions, along with park (P) when the automobile can be started.

2. a. The water pump is used to circulate cooling fluid throughout the engine.

3. c. The braking system uses friction in both drum brakes and disc brakes to slow the car down.

4. a. In a rack and pinion steering system, the gear teeth of a pinion gear operate along a rack where the teeth engage, causing the linkage mechanism to turn the car wheels.

5. b. The clutch disconnects the engine from the transmission so that you can shift gears.

6. c. The universal joint is where the main driveshaft connects with the drive axle and transmits the rotary motion between these two shafts that aren't in a straight line.

7. d. In a typical automobile electrical system with the engine off, battery power can power only the lights and certain accessories, such as internal lighting and the horn. The other items listed need the engine or alternator running (such as power windows) or are a system that doesn't require electrical power (catalytic converter).

8. b. Shock absorbers are a part of the suspension system of a car. The car springs absorb any bumps in the road and the shock absorbers dampen out the spring action.

9. b. When the piston rings are worn, the pressure in the engine system will force oil into the compression chamber of the engine (called *blow by*) where it will be burned in the power cycle of the internal combustion engine.

10. b. Most auto manufacturers recommend that engine oil should be changed every 3,000 miles, unless severe conditions are experienced while driving.

11. b. A typical 12-volt car starter battery connects six galvanic cells in a series, each of which provides 2.1 volts, for a total of 12.6 volts at full charge.

12. a. The universal joint, driveshaft, and the clutch are all part of the drive train of an automobile.

13. d. An inside caliper would be the measuring device that could measure the inside diameter of a tube. The other measuring devices could provide you a measurement but it would not be as precise or exact.

14. d. A metal punch is used to make holes in sheet metal.

15. b. A keyhole saw is the type of saw used to cut an outlet or light switch hole in a piece of Sheetrock. The other saws listed could cut the Sheetrock, but not in the manner needed.

16. c. A piece of lumber stamped with S-DRY or KD indicates 19% maximum moisture content. A piece of lumber stamped with MC-15 or KD-15 indicates 15% maximum moisture content (choice **b**); a piece of lumber stamped with S-GRN indicates greater than 19% moisture content (choice **d**) unseasoned.

17. c. The blade tooth pattern and kerf of a hacksaw is designed to cut iron, steel, and other softer metals.

18. a. A standard claw hammer weighs 16 ounces.

19. b. A carpenter would use a nail set to drive the head of a finish nail just below the surface of the wood. The hole would then be treated with wood filler, sanded, and painted to hide the nail hole.

20. c. On stairs or decks, a baluster is one of a set of closely spaced supports.

21. d. A cat's paw is a combination tool that can be used as a nail remover, pry bar, and multi-utility tool.

22. d. A miter saw is designed to make precise, exact angled cuts. All the other saws listed could be used to make angled cuts, however nowhere near as precise or exact.

23. c. Concrete footings that support structures need to be at least 8 inches in diameter to ensure stability and strength.

24. a. Due to the drying process and the planing of lumber, its true size is reduced by one half of an inch to its finished size.

25. b. A carpenter's compass is used to draw circles or arcs.

Part 8: Mechanical Comprehension

1. a. Every foot block A is lowered will raise block B by the same amount. To equalize the 10-foot difference, block A must be lowered 10 feet ÷ 2 = 5 feet.

2. d. Gear 2 turning counterclockwise will lead all gears it touches to turn clockwise.

3. d. When George leaves, Lenny will have already traveled 8 mph × 0.5 hours = 4 miles. George runs 2 mph faster than Lenny. Since Lenny got a 4-mile head start, it will take George 4 miles ÷ 2 mph = 2 hours to catch Lenny. Since George left at 6:30 A.M., he will catch Lenny at 8:30 A.M.

4. b. Mechanical advantage (MA) is the factor by which a simple machine multiplies for the force put into it. In this case, 60 pounds of force is used to move a 240-pound block, so MA = 240 ÷ 60 = 4. The MA of a ramp is determined by the length of the ramp, l, divided by the height gained, h. In this case, MA $= 3 = \frac{l}{h} = \frac{l}{8}$ feet . Solving for l tells us the ramp is 32 feet long.

5. d. The weight of the load is spread over 4 cables, so the mechanical advantage is 4.

6. c. $w_1 \times d_1 = w_2 \times d_2$. $w_1 \times 8$ feet = 200 pounds × 12 feet. Solving for w_1 gives 300 pounds.

7. a. Each block will have a different size and weight, but, since each is made from the same material, they will all have the same density. Since an object's density determines whether it will float or sink in water, all three objects will either float or sink.

8. c. If 8 pounds of force will move a spring 4 inches, it has a force constant of 8 pounds ÷ 4 inches = 2 pounds per inch. Moving the spring 12 inches will require 12 inches × 2 pounds per inch = 24 pounds of force.

9. d. There are 7 threads per inch. To move the nut 3 inches will require 7 × 3 = 21 turns.

10. d. Oil is a lubricant used to decrease the amount of friction between the many moving parts in an engine.

11. c. The mechanical advantage of this pulley system is 2. The force required to lift the 80-pound load is 80 pounds ÷ 1 = 80 pounds.

12. b. A single fixed pulley has the advantage of being able to change the direction of force. Thus, a flag can be raised up a flagpole without having to climb and lift it.

13. d. Gear 2 turning clockwise will cause the neighboring gears to turn counterclockwise, so no other gears will turn clockwise.

14. b. $w_1 \times d_1 = w_2 \times d_2$. Andre is 24 feet away from the pivot point. 126 pounds × 12 feet = 12 feet × w_2. Solving for w_2 gives 63 pounds.

15. a. 500 pounds ÷ 2.5 inches = 200 pounds per inch.

16. b. Valves 2, 3, and 5 are all directly connected to the break and so must remain closed. 1 and 4 may be opened to successfully route the flow from A to B.

17. d. Each full turn of the pedals will turn the rear wheel 48 ÷ 12 = 4 revolutions. If the pedals are turning at 90 rpm, the rear wheel will move at 4 × 90 rpm = 360 rpm.

18. d. Frictional forces point in the opposite direction of motion (arrow B).

19. a. Of the materials listed, metal objects are the best at conducting heat and therefore will warm the fastest. Plastic, glass, and ceramic are all good insulators and thus will take a long time to absorb heat.

20. c. A pulley system of this type has a mechanical advantage of 2. So, to lift a 300-pound weight will require 300 pounds ÷ 2 = 150 pounds.

21. b. A screw is a special type of inclined plane where the ramp is wrapped around a cylindrical object.

22. a. $w_1 \times d_1 = w_2 \times d_2$. 57 pounds × 6 feet = 76 pounds × d_2. Solving for d_2 gives 4.5 feet.

23. c. While ramp B offers a greater mechanical advantage, the amount of work is determined by the overall change in height of the barrel. Since the barrel is raised the same height regardless of which ramp is used, the amount of work done is the same.

24. a. Since A and B are identical in size, they will rotate at the same rate. The belt connects the two, so A and B also rotate in the same direction.

25. a. The mechanical advantage (MA) of a ramp is determined by the length of the ramp, *l*, divided by the height gained, *h*. In this case, MA = $\frac{l}{h}$ = 36 feet ÷ 4 feet = 9. The force required to pull a 270-pound block up a ramp is 270 pounds ÷ 9 = 30 pounds.

Part 9: Assembling Objects

1. d.
2. b.
3. d.
4. d.

5. b.
6. d.
7. a.
8. b.
9. c.
10. d.
11. a.
12. a.
13. c.
14. d.
15. d.
16. b.
17. a.
18. d.
19. a.
20. b.
21. a.
22. a.
23. a.
24. c.
25. b.

Scoring

Write your raw score (the number you got right) for each test in the blanks below. Then turn to Chapter 2 to find out how to convert these raw scores into the scores the armed services use.

1. General Science: _____ right out of 25
2. Arithmetic Reasoning: _____ right out of 30
3. Word Knowledge: _____ right out of 35
4. Paragraph Comprehension: _____ right out of 15
5. Mathematics Knowledge: _____ right out of 25
6. Electronics Information: _____ right out of 20
7. Auto and Shop Information: _____ right out of 25
8. Mechanical Comprehension: _____ right out of 25
9. Assembling Objects: _____ right out of 25