

Part 1: General Science

Time: 11 minutes

- Which planet is next farthest away from the sun after Earth?
 - Venus
 - Mercury
 - Jupiter
 - Mars
- Which trait would prevent a new unidentified species from being categorized in the kingdom Animalae?
 - asexual reproduction
 - cell walls
 - no backbone
 - hard exoskeleton
- Which of the following represents a possible human nucleotide base pairing?
 - A–U
 - G–U
 - C–T
 - A–G
- In order to force the energy from a heat source to fill a space, which process would be best to use?
 - conduction
 - convection
 - radiation
 - thermal expansion
- To determine an airplane's velocity, what measurements are needed?
 - acceleration and time
 - distance and force
 - distance and time
 - airspeed and mass
- Which law predicts that if the temperature (in Kelvin) doubles, the volume will also double?
 - Avogadro's Law
 - Boyle's Law
 - Gay-Lussac's Law
 - Charles's Law
- A cell that is unable to deliver genetic instructions to the ribosome may have problems with
 - mRNA.
 - codons.
 - tRNA.
 - rRNA.
- The ribosome structures in all types of cells are responsible for
 - digesting food.
 - producing energy.
 - storing RNA.
 - producing protein.
- Solid CO_2 is formed at high pressure and low temperature. Once it is brought to room temperature and atmospheric pressure, it is expected to sublime. What do you expect to happen?
 - It will change state from solid to liquid to gas.
 - It will remain frozen.
 - It will become a gas.
 - Its temperature and pressure will increase.
- Organisms with greater diversity and more adaptations typically utilize
 - asexual reproduction.
 - meiosis.
 - mitosis.
 - mutualism.

- 11.** The cellular component or organelle where photosynthesis takes place is the
- chloroplast.
 - mitochondrion.
 - Golgi body.
 - nucleus.
- 12.** A force is applied to a 30-kg object, resulting in an acceleration of 15 m/s. What is the force being applied to the object?
- 15 N
 - 30 N
 - 45 N
 - 450 N
- 13.** How many grams of NaOH would be needed to make 250 mL of 0.200 M solution? (molecular weight of NaOH 40.0)
- 8.00 g
 - 4.00 g
 - 2.00 g
 - 2.50 g
- 14.** Cells of various organ systems
- have completely different DNA.
 - have the same DNA.
 - only have DNA for the specific organ system.
 - have different organelles.
- 15.** At a fault line where one tectonic plate moves underneath another, what process is occurring?
- subduction
 - transversing
 - submerging
 - trenching
- 16.** When sound travels from air into a vacuum, its speed
- decreases.
 - increases.
 - remains constant.
 - becomes zero.
- 17.** Blood from the lungs travels to the left atrium of the heart through the
- aorta.
 - vena cava.
 - pulmonary artery.
 - pulmonary vein.
- 18.** Which accessory organ detoxifies substances in the blood absorbed through the intestines?
- the liver
 - the kidney
 - the pancreas
 - the spleen
- 19.** To measure the flow of electricity through a circuit you need a device reading which unit?
- the ohm
 - the volt
 - the ampere
 - the joule
- 20.** Which one of the following elements will resist forming an anion most?
- F
 - N
 - P
 - Cl
- 21.** Which does NOT encourage natural selection?
- traits learned by parents
 - some traits that are helpful to survival
 - harsh climates
 - competition for limited resources
- 22.** To observe the interactions of different species in a local habitat and the effects of environmental factors, which of the following should be studied?
- a food web
 - a biome
 - a community
 - an ecosystem

- 23.** Water and nutrients move through transport tubes, such as xylem and phloem, in which of the following plant groups?
- nonvascular plants
 - tracheophytes
 - mosses
 - liverworts
- 24.** What are the products of the following equation?
sodium chloride(aq) + lead(II) nitrate(aq) →
- sodium nitrate + lead(II) chloride
 - sodium + chloride
 - sodium + chloride + lead(II) + nitrate
 - sodium(II) nitrate + lead chloride
- 25.** What is the maximum number of electrons that the second energy level can hold?
- 8
 - 6
 - 2
 - 16

Part 2: Arithmetic Reasoning

Time: 36 minutes

- 1.** Linda needs to read 14 pages for her history class, 26 pages for English, 12 pages for civics, and 28 pages for biology. She has read $\frac{1}{6}$ of the entire number of pages. How many pages has she read?
- 80
 - $13\frac{1}{3}$
 - $48\frac{1}{2}$
 - 17
- 2.** George has made a vow to jog for an average of one hour daily five days a week. He cut his workout short on Wednesday by 40 minutes, but was able to make up 20 minutes on Thursday and 13 minutes on Friday. How many minutes of jogging did George lose for the week?
- 20 minutes
 - 13 minutes
 - 7 minutes
 - 3 minutes
- 3.** A train travels 300 miles in six hours. If it was traveling at a constant speed the entire time, what was the speed of the train?
- 50 miles per hour
 - 60 miles per hour
 - 180 miles per hour
 - 1,800 miles per hour
- 4.** Of 150 people polled, 105 said they rode the city bus at least three times per week. How many people out of 100,000 could be expected to ride the city bus at least three times each week?
- 55,000
 - 70,000
 - 72,500
 - 75,000

5. The cost of a certain type of fruit is displayed in the following table.

WEIGHT (IN LBS.)	COST (IN DOLLARS)
4 lbs.	\$1.10
5 lbs.	\$1.74

Based on the table, estimate the cost for 4 pounds 8 ounces of the same type of fruit.

- a. \$1.24
b. \$1.32
c. \$1.35
d. \$1.42
6. Larry buys three puppies at the Furry Friends Kennel for a total cost of \$70. Two of the puppies are on sale for \$15 apiece. How much does the third puppy cost?
a. \$55
b. \$40
c. \$30
d. \$25
7. If Rita can run around the block five times in 20 minutes, how many times can she run around the block in one hour?
a. 10
b. 15
c. 50
d. 100
8. Meda arrived at work at 8:14 A.M., and Kirstin arrived at 9:12 A.M. How long had Meda been at work when Kirstin got there?
a. 1 hour 8 minutes
b. 1 hour 2 minutes
c. 58 minutes
d. 30 minutes
9. How many pounds of chocolates costing \$5.95 per pound must be mixed with three pounds of caramels costing \$2.95 per pound to obtain a mixture that costs \$3.95 per pound?
a. 1.5 pounds
b. 3 pounds
c. 4.5 pounds
d. 8 pounds
10. Marcia is 10 years older than Fred, who is 16. How old is Marcia?
a. 6 years old
b. 20 years old
c. 26 years old
d. 30 years old
11. Ralph's newborn triplets weigh $4\frac{3}{8}$ pounds, $3\frac{5}{6}$ pounds, and $4\frac{7}{8}$ pounds. Harvey's newborn twins weigh $7\frac{2}{6}$ pounds and $9\frac{3}{10}$ pounds. Whose babies weigh the most and by how much?
a. Ralph's triplets by $3\frac{1}{2}$ pounds
b. Ralph's triplets by $2\frac{1}{4}$ pounds
c. Harvey's twins by $1\frac{2}{3}$ pounds
d. Harvey's twins by $3\frac{11}{20}$ pounds
12. How many quarters are there in \$12?
a. 12
b. 120
c. 24
d. 48
13. Marty left his workplace at 5:16 P.M. on Thursday and returned at 7:58 A.M. on Friday. How much time elapsed between the time Marty left work on Thursday and the time he returned on Friday?
a. 2 hours 42 minutes
b. 13 hours 42 minutes
c. 14 hours 42 minutes
d. 14 hours 52 minutes

- 14.** Carmella and Mariah got summer jobs at the ice cream shop and were supposed to work 15 hours per week each for eight weeks. During that time, Mariah was ill for one week and Carmella took her shifts. How many hours did Carmella work during the eight weeks?
- 120 hours
 - 135 hours
 - 150 hours
 - 185 hours
- 15.** Which of the following is a translation of the statement “Twice the sum of six and four”?
- $2 + 6 + 4$
 - $2 \times 6 + 4$
 - $2(6 + 4)$
 - $(2 \times 6) \times 4$
- 16.** Jerry’s Fish Market was shipped 400 pounds of cod packed into 20-pound crates. How many crates were needed for the shipment?
- 80 crates
 - 40 crates
 - 20 crates
 - 10 crates
- 17.** A train moving at a constant speed leaves Chicago for Los Angeles (at time $t = 0$). If Los Angeles is 2,000 miles from Chicago, which of the following equations describes the distance (D) from Los Angeles at any time t ?
- $D(t) = 60t - 2,000$
 - $D(t) = 60t$
 - $D(t) = 2,000 - 60t$
 - $D(t) = 2,000 + 60t$
- 18.** Each week Jaime saves \$25. How long will it take her to save \$350?
- 12 weeks
 - 14 weeks
 - 16 weeks
 - 18 weeks
- 19.** If one pint is $\frac{1}{8}$ of a gallon, how many pints are there in $3\frac{1}{3}$ gallons of ice cream?
- $\frac{7}{16}$ pint
 - $24\frac{1}{2}$ pints
 - $26\frac{1}{16}$ pints
 - 28 pints
- 20.** In the music department at a school, a music teacher counted the musical instruments and supplies in storage. There were:
- one violin valued at \$1,200
 - two violin bows, each valued at \$350
 - three music stands, each valued at \$55
 - one trumpet valued at \$235

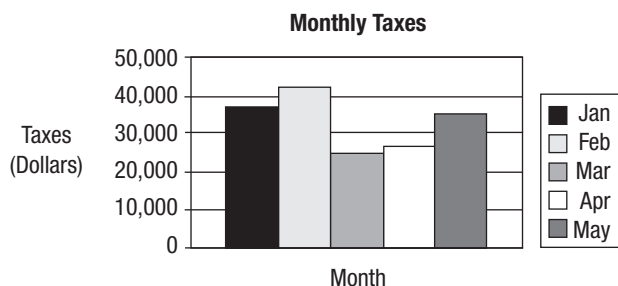
Use the following table to answer question 17.

DISTANCE TRAVELED FROM CHICAGO WITH RESPECT TO TIME	
TIME (HOURS)	DISTANCE FROM CHICAGO (MILES)
1	60
2	120
3	180
4	240

- In addition, there were a number of supplies totaling \$125 and some sheet music worth \$75. What was the total value of the musical supplies and instruments in storage?
- \$2,040
 - \$2,500
 - \$3,040
 - \$3,500

- 21.** Which of the following is a translation of the following sentence? Salwa (S) is ten years older than Roland (R).
- $10 + S = R$
 - $S + R = 10$
 - $R - 10 = S$
 - $S = R + 10$

Use the following table to answer question 22.



- 22.** Approximately what were the total taxes collected for January, February, and April?
- \$78,000
 - \$98,000
 - \$105,000
 - \$115,000
- 23.** The temperature at 6:00 P.M. was 31°F . By midnight, it had dropped 40°F . What was the temperature at midnight?
- 9°F
 - -9°F
 - -11°F
 - 0°F
- 24.** Which of the following best represents the following sentence? Rachel (R) had three apples and ate one.
- $R = 3 - 1$
 - $3 - 2 = R$
 - $R = 3 \times 2$
 - $3R - 2$
- 25.** Find the next number in the following pattern: 320, 160, 80, 40
- 35
 - 30
 - 10
 - 20
- 26.** A sprinkler system installed in a home that is under construction will cost about 1.5% of the total building cost. The same system, installed after the home is built, costs about 4% of the total building cost. How much would a homeowner save by installing a sprinkler system in a \$150,000 home while the home is still under construction?
- \$600
 - \$2,250
 - \$3,750
 - \$6,000
- 27.** Fifth graders Kara and Rani both have lemonade stands. Kara sells her lemonade at five cents a glass, and Rani sells hers at seven cents a glass. Kara sold 17 glasses of lemonade today, and Rani sold 14 glasses. Who made the most money and by what amount?
- Kara by 13 cents
 - Rani by 13 cents
 - Kara by 85 cents
 - Rani by 98 cents

28. If Linda purchases an item that costs \$30 or less, she will pay with cash. If Linda purchases an item that costs between \$30 and \$70, she will pay with a check. If Linda purchases an item that costs \$70 or greater, she will use a credit card. If Linda recently paid for a certain item using a check, which of the following statements could be true?

- a. The item cost \$80.
- b. If the item had cost \$20 more, she would have paid with cash.
- c. The item cost at least \$70.
- d. The item cost more than \$25.

29. Joni is 5 feet 11 inches tall, and Pierre is 6 feet 5 inches tall. How much taller is Pierre than Joni?

- a. 1 foot 7 inches
- b. 1 foot
- c. 7 inches
- d. 6 inches

30. Dani spent \$6,300 on a used car. She paid \$630 as a down payment. What fraction of the original cost was the down payment?

- a. $\frac{1}{10}$
- b. $\frac{1}{18}$
- c. $\frac{1}{20}$
- d. $\frac{1}{40}$

Part 3: Word Knowledge

Time: 11 minutes

1. *Lure* most nearly means

- a. fish.
- b. attract.
- c. resist.
- d. suspect.

2. *Delirious* most nearly means

- a. manic.
- b. calm.
- c. tasty.
- d. suspicious.

3. *Infirm* most nearly means

- a. agree.
- b. strong.
- c. weak.
- d. validate.

4. *Perilous* most nearly means

- a. disciplined.
- b. dangerous.
- c. safe.
- d. honest.

5. *Isolation* most nearly means

- a. fear.
- b. plentitude.
- c. solitude.
- d. disease.

6. *Lull* most nearly means

- a. pause.
- b. hole.
- c. noise.
- d. boring.

7. *Outfit* most nearly means

- a. indoors.
- b. strong.
- c. special.
- d. furnish.

8. *Omit* most nearly means

- a. recluse.
- b. neglect.
- c. mistake.
- d. destroy.

- 9.** *Mutiny* most nearly means
- rebellion.
 - currency.
 - sailor.
 - hassle.
- 10.** *Naïve* most nearly means
- rural.
 - secular.
 - unsophisticated.
 - church.
- 11.** *Rudimentary* most nearly means
- crass.
 - gracious.
 - deliberate.
 - primitive.
- 12.** *Pompous* most nearly means
- arrogant.
 - supportive.
 - busy.
 - gaudy.
- 13.** *Prevalent* most nearly means
- widespread.
 - rare.
 - wind.
 - servile.
- 14.** *Abundance* most nearly means
- trouble.
 - foolish.
 - wealth.
 - love.
- 15.** *Calamity* most nearly means
- potion.
 - silence.
 - shellfish.
 - disaster.
- 16.** *Superficial* most nearly means
- gorgeous.
 - shallow.
 - intelligent.
 - rich.
- 17.** *Reform* most nearly means
- punish.
 - destroy.
 - display.
 - correct.
- 18.** *Methodical* most nearly means
- rhythmic.
 - poetic.
 - systematic.
 - disrespectful.
- 19.** *Spite* most nearly means
- joy.
 - beverage.
 - wonder.
 - malice.
- 20.** *Scale* most nearly means
- climb.
 - sail.
 - swim.
 - skate.
- 21.** *Smudge* most nearly means
- gloat.
 - residue.
 - blur.
 - celebrate.
- 22.** *Drizzle* most nearly means
- curly.
 - sprinkle.
 - sear.
 - drench.

- 23.** *Mundane* most nearly means
- dirty.
 - commonplace.
 - confused.
 - extraordinary.
- 24.** *Mirth* most nearly means
- anger.
 - glee.
 - sarcasm.
 - mistrust.
- 25.** *Drudgery* most nearly means
- silliness.
 - evil.
 - labor.
 - investigation.
- 26.** *Prerequisite* most nearly means
- necessary.
 - course.
 - difficult.
 - tar.
- 27.** Gerard has such a *caustic* sense of humor that most people find his jokes upsetting rather than humorous.
- sarcastic
 - funny
 - honest
 - original
- 28.** Sandra is truly an *enigma*; although she's lived here for years and everyone knows her, no one seems to know anything about her.
- stranger
 - enemy
 - newcomer
 - mystery
- 29.** Everyone loved Ilona's idea, and she quickly *garnered* enough support for her proposal to present it to the committee.
- created
 - proposed
 - needed
 - gathered
- 30.** Hattie's attempt to finally complete the marathon was *thwarted* when she twisted her ankle in the 23rd mile.
- injured
 - prevented
 - supported
 - completed
- 31.** Although the plot of the film is admittedly *trite*, the characters are so endearing that the movie is highly entertaining despite the old storyline.
- original
 - exciting
 - complex
 - overused
- 32.** Anthony, a meticulous young man, *diligently* watered his neighbors' plants once a week while they were on vacation.
- reluctantly
 - dutifully
 - haphazardly
 - predictably
- 33.** Although Hunter was *reticent* about revealing information to us when we first met him, he soon began to talk more than anyone.
- quick
 - voluntary
 - reluctant
 - talkative

34. Being a direct relative of the deceased, her claim to the estate was *legitimate*.
- lawful
 - spurious
 - dubious
 - honest
35. The Earth Day committee leader placed large garbage bins in the park to *facilitate* Saturday's cleanup.
- hinder
 - assist
 - plan
 - begin

Part 4: Paragraph Comprehension

Time: 13 minutes

Monday, Tuesday, Wednesday, Thursday. . . . We all know the days of the week, but have you ever wondered where their names came from? The answer dates back to the ancient Greeks, who decided to name the weekdays after their *pantheon* of gods. Two of their primary gods were the Sun and the Moon, so they named the first two days of the week after them; these names survive in modern English as Sun-day and Moon-day (Sunday and Monday).

Other day names are not quite so obvious to the modern person, however. This is because English is a Germanic language, influenced by the ancient German peoples, who translated the Greek and Norse gods into their own language. The Greeks, for example, named the third day after Mars, their god of war; the ancient Germanic peoples named it after Tiw (also known as Tyr), their god of war—giving us Tuesday (Tiw's Day). Wednesday is named after Woden, the ancient Germanic god of musical inspiration. Thursday is named for Thor, the Germanic

thunder god, while Friday is named for Frigga, Germanic goddess of love (like the Roman god Venus). Finally, Saturday is named after Saturn, ancient god of the harvest.

- What is the main idea of this passage?
 - The days of the week are named after the sun, the moon, and ancient gods.
 - English is a Germanic language.
 - The ancient Germans had gods that were like the Greeks' gods.
 - Thursday is named after Thor.
- According to the passage, Wednesday is named after
 - the god of speed.
 - the god of war.
 - the god of inspiration.
 - the god of love.
- As used in the passage, *pantheon* most nearly means
 - a sports coliseum.
 - a wild animal.
 - the days of the week.
 - a list of ancient gods.
- From this passage, you can infer that
 - ancient mythology played a role in the development of modern English.
 - the Greeks worshiped different gods from the Romans.
 - ancient Germans spoke English.
 - Mercury is similar to Thor.

Linoleum was invented in 1860 by a British man named Frederick Walton. It is actually a natural compound made from linseed oil, pine rosin, and pine flour. To that mixture is added wood pulp or other fibers to give it a stiff consistency. Walton named his invention linoleum from the Latin word *linum*, meaning flax (from which linseed oil is

made) and *oleum*, meaning oil. Linoleum is still widely used around the world today for floorings and countertops.

5. Linoleum got its name from
 - a. Latin words meaning “flax oil.”
 - b. Greek words meaning “floor covering.”
 - c. the inventor’s imagination.
 - d. the British patent office.

6. The main idea of this passage is
 - a. that Latin is used in naming inventions.
 - b. the many uses of linoleum.
 - c. why linoleum is used around the world.
 - d. the history of linoleum.

Today’s postal service is more efficient than ever. Mail that once took months to move by horse and foot now moves around the country in days or hours by truck, train, and plane. If your letter or package is urgent, the U.S. Postal Service offers Priority Mail and Express Mail services. Priority Mail is guaranteed to go anywhere in the United States in two days or less, while Express Mail will get your package there overnight.

7. This paragraph best supports the statement that
 - a. more people use the post office for urgent deliveries than any other delivery service.
 - b. Express Mail is a good way to send urgent mail.
 - c. Priority Mail usually takes two days or less.
 - d. mail service today is more effective and dependable.

8. According to the passage, Priority Mail will get a package delivered
 - a. overnight.
 - b. in two days or less.
 - c. within a week.
 - d. in three hours.

Paper clips are such an everyday item that most of us don’t even notice them. We use them to get stuck disks out of computers, to clean dirt from tiny *crevices*, to fix our eyeglasses, and a million other things—and sometimes we even use them to clip papers together! But if you think about it, you’ll realize that somebody had to invent the paper clip; it didn’t suddenly drop out of the sky one day.

That inventor was a Norwegian named Johan Vaaler who registered his idea with the German patent office in 1899 for a “rectangular, triangular, or otherwise shaped hoop” that could be used to fasten papers together. Previously, people had used ribbons, pins, and even string to bind paper, but Vaaler’s simple idea changed that forever.

9. The author of this passage thinks that paper clips
 - a. are funny.
 - b. are a useful invention.
 - c. fell from the sky.
 - d. should be used for other things besides clipping paper.

10. As used in the passage, *crevices* most nearly means
 - a. small cracks.
 - b. ceiling paint.
 - c. fast-moving water.
 - d. tiny bumps.

11. According to the passage, which of the following was once used to bind papers together?
 - a. tape
 - b. hairpins
 - c. string
 - d. glue

- 12.** Where was the first paper clip patented, according to the passage?
- Norway
 - Germany
 - United States
 - not stated

Daffodil bulbs require well-drained soil and a sunny planting location. They should be planted in holes that are 3 to 6 inches deep, and there should be 2 to 4 inches between bulbs. The bulb should be placed in the hole, pointed side up, root side down. Once the bulb is planted, water the area thoroughly.

- 13.** According to the preceding directions, when planting daffodil bulbs, which of the following conditions is not necessary?
- a sunny location
 - well-drained soil
 - proper placement of bulbs in soil
 - proper fertilization
- 14.** According to the directions, which of the following is true?
- Daffodils do best in sandy soil.
 - Daffodil bulbs should be planted in autumn for spring blooming.
 - It is possible to plant daffodil bulbs upside down.
 - Daffodil bulbs require daily watering.

Please use the green garbage bags to dispose of all medical waste. White garbage bags are for clean trash only, and red garbage bags are to be used for sensitive paper waste. Adherence to these regulations is vitally important for the safety of all personnel.

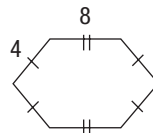
- 15.** Why is it important to dispose of medical waste in green garbage bags, according to this passage?
- Medical waste can be dangerous if not properly treated.
 - Green is the universal color for medical waste.
 - The green bags are stronger than the red and white bags.
 - The reason is not stated.

Part 5: Mathematics Knowledge

Time: 24 minutes

- 1.** Five more than 20% of a number is 52. Find the number.
- 50
 - 60
 - 70
 - 100

- 2.** What is the perimeter of the following polygon?



- 12
 - 16
 - 24
 - 32
- 3.** Which of the following phrases means *percent*?
- per part
 - per 100 parts
 - per fraction
 - per decimal

- 4.** What is the square root of 64?
- 8
 - 32
 - 128
 - 4,096
- 5.** Which of the following numbers can be divided evenly by 19?
- 54
 - 63
 - 76
 - 82
- 6.** If pentagon $ABCDE$ is similar to pentagon $FGHIJ$, and $AB = 10$, $CD = 5$, and $FG = 30$, what is HI ?
- $\frac{5}{3}$
 - 5
 - 15
 - 30
- 7.** Each of the following figures has exactly two pairs of parallel sides EXCEPT a
- parallelogram.
 - rhombus.
 - trapezoid.
 - square.
- 8.** What is the greatest common factor of the following monomials: $3x^2$, $12x$, $6x^3$?
- 12
 - $3x$
 - $6x$
 - $3x^2$
- 9.** Which of the following lists three consecutive even integers whose sum is 30?
- 9, 10, 11
 - 8, 10, 12
 - 9, 11, 13
 - 10, 12, 14
- 10.** $0.06 =$
- 0.60%
 - 6.0%
 - 60.0%
 - 600%
- 11.** Forty cents is what percent of \$1.30?
- 40%
 - 31%
 - 20%
 - 11%
- 12.** A right angle is
- 180° .
 - greater than 90° .
 - exactly 90° .
 - less than 90° .
- 13.** Which of the following lengths could form the sides of a triangle?
- 1, 2, 3
 - 2, 2, 5
 - 2, 3, 6
 - 2, 3, 2
- 14.** How many faces does a cube have?
- 4
 - 6
 - 8
 - 12
- 15.** Which of the following is a prime number?
- 6
 - 9
 - 11
 - 27
- 16.** 32% converted to a fraction =
- $\frac{1}{32}$
 - $\frac{8}{32}$
 - $\frac{8}{25}$
 - $\frac{1}{25}$

17. $16\sqrt{2} - 4\sqrt{2} =$
- 12
 - $12\sqrt{2}$
 - $12 - \sqrt{2}$
 - 20
18. If $\frac{2}{5} = \frac{x}{45}$, what is x ?
- 9
 - 12
 - 18
 - 90
19. A triangle has angles of 71° and 62° . Which of the following best describes the triangle?
- acute scalene
 - obtuse scalene
 - acute isosceles
 - obtuse isosceles
20. $0.75 + 0.518 =$
- 12.68
 - 0.01268
 - 0.1268
 - 1.268
21. What is the greatest area possible enclosed by a quadrilateral with a perimeter of 24 feet?
- 6 square feet
 - 24 square feet
 - 36 square feet
 - 48 square feet
22. Solve for p in the following equation:
 $2.5p + 6 = 18.5$
- 5
 - 10
 - 15
 - 20
23. Evaluate the expression: $|-14| + -5$
- 19
 - 19
 - 9
 - 9
24. What is another way to write 7.25×10^3 ?
- 72.5
 - 725
 - 7,250
 - 72,500
25. How many inches are there in four feet?
- 12 inches
 - 36 inches
 - 48 inches
 - 52 inches

Part 6: Electronics Information

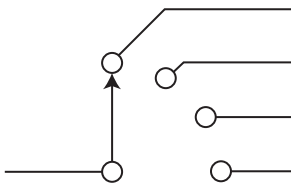
Time: 9 minutes

- Data stored on magnetic tape can be lost by which of the following?
 - exposure to light
 - freezing temperatures
 - exposure to heat
 - low air pressure
- Fill in the blank to make the following sentence true: "Current is the _____ an electrical charge passes a specific point in a circuit."
 - direction in which
 - rate at which
 - mass with which
 - acceleration with which

3. In a series circuit there are 7 resistors, each with a resistance of 67Ω . What is the total resistance?
- 37.5Ω
 - 67Ω
 - 234.5Ω
 - 469Ω

4. In a parallel circuit there are 7 resistors, each with a resistance of 67Ω . What is the total resistance?
- 37.5Ω
 - 67Ω
 - 234.5Ω
 - 469Ω

5. This schematic symbol represents what type of switch?



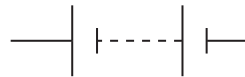
- multi-way switch
 - multi-pole switch
 - slide switch
 - rocker switch
6. The pressure of current is called?
- voltage
 - ohms
 - amperes
 - none of the above
7. AC refers to what?
- ampere current
 - ampere component
 - alternating current
 - alternating component

8. DC refers to what?
- diode charge
 - direct current
 - direct charge
 - diode current
9. The process used in electroplating is known as
- electrochemistry.
 - electrocoating.
 - electrolysis.
 - electrodeposition.

10. What does this schematic symbol represent?



- a bell
 - a motor
 - a lamp
 - a buzzer
11. What does RMS mean?
- resistant motor system
 - real matrix standard
 - range motion symbol
 - root mean square
12. What does this schematic symbol represent?



- a fuse
 - a battery
 - a transformer
 - a cell
13. What is the speed of radio waves radiated into free space?
- 300,000,000 meters per second
 - 300,000,000 meters per minute
 - 343 meters per second
 - 343 meters per minute

14. To cause a current of 10 amps to flow through 20 ohms resistance, the voltage needs to be?
- 10
 - 20
 - 2
 - 200

15. Which is NOT an insulator of electricity?
- plastic
 - water
 - paper
 - glass

16. Microwave ovens operate by
- thermal expansion.
 - convection heating.
 - dielectric heating.
 - trieletric heating.

17. Which of the following is a diode that is used to regulate voltage?
- zener diode
 - photodiode
 - capacitor
 - light emitting diode

18. What does this schematic symbol represent?



- a cell
- an antenna
- a wire
- a ground

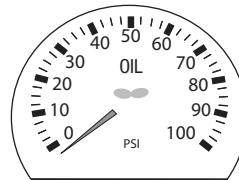
19. The ground wire is always what color in 120-volt wiring in the United States?
- white
 - black
 - green
 - orange

20. A 120-volt current is protected by a 30-amp circuit breaker. What is the largest watt appliance that can be used safely?
- 36
 - 3,600
 - 360
 - 4

Part 7: Auto and Shop Information

Time: 11 minutes

1. The gauge shown here is calibrated to read in what measurement?



- pounds per linear foot
 - pounds per square inch
 - meters per foot
 - oil temperature
2. An automobile radiator cools the engine coolant by
- rapid circulation through a cooling coil.
 - freon in the air conditioning system.
 - the flow of air across the radiator grills.
 - high pressure energy.
3. Which of the following would indicate an overinflated tire?
- excessive wear in the middle of the tire tread
 - excessive wear on the edges of the tire thread
 - excessive wear on the outer edge of the front right tire tread
 - none of the above

4. An automobile that bounces a lot on roads would most likely have a problem with
 - a. front end alignment.
 - b. shock absorbers.
 - c. rear end alignment.
 - d. engine mounts.

5. What is the primary function of the water pump in a car?
 - a. to circulate coolant
 - b. to evacuate waste water
 - c. to remove exhaust
 - d. to filter water

6. The purpose of the crankshaft is
 - a. to start the engine.
 - b. to convert the up-and-down motion of the pistons and tie rods into rotational movement.
 - c. to ensure the universal joint correctly powers the rear axle.
 - d. none of the above

7. An automobile differential is located in the
 - a. gear box.
 - b. distributor.
 - c. universal joint.
 - d. drive axle.

8. The purpose of a camshaft in an internal combustion engine is to
 - a. provide ignition of the fuel.
 - b. provide cooling of the fuel.
 - c. provide lubrication of the engine.
 - d. transfer energy to the drivetrain.

9. Vernier calipers are used to perform which of the following functions?
 - a. tightening
 - b. measuring
 - c. cutting
 - d. drilling

10. Which of the following automotive systems uses lubrication fluid?
 - a. the transmission system
 - b. the exhaust system
 - c. the suspension system
 - d. the electrical system

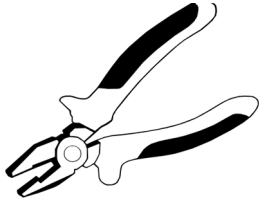
11. To which automotive system does the alternator belong?
 - a. the steering system
 - b. the cooling system
 - c. the electrical system
 - d. the engine

12. What is the function of the spark plugs in the internal combustion engine in a car?
 - a. to transfer electricity to the alternator
 - b. to increase the cylinder size
 - c. to cool the engine
 - d. to ignite the fuel

13. Which fluid is contained in a car radiator?
 - a. transmission fluid
 - b. cooling fluid
 - c. brake fluid
 - d. steering fluid

14. A plumber, looking to turn soft iron pipes or fittings with a rounded surface, would most likely use which tool?

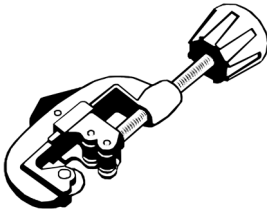
a.



b.



c.



d.



15. A floor plan is drawn to scale so that $\frac{1}{4}$ inch represents 2 feet. If a hall on the plan is 4 inches long, how long will the actual hall be when it is built?

- a. 2 feet
- b. 8 feet
- c. 16 feet
- d. 32 feet

16. All the rooms in a building are rectangular, with 8-foot ceilings. One room is 9 feet wide by 11 feet long. What is the combined area of the four walls, including doors and windows?

- a. 99 square feet
- b. 160 square feet
- c. 320 square feet
- d. 72 square feet

17. What tool is used to hold a piece of material in a fixed position?

- a. a biscuit joiner
- b. a router
- c. a vise
- d. a caliper

18. Which of the following is NOT a carpenter's hand tool?

- a. a winch
- b. a level
- c. a compass
- d. a chisel

19. To a welder, what do ammonium chloride, rosin, hydrochloric acid, zinc chloride, and borax have in common?

- a. They are all common types of metal polishing materials.
- b. They are all common types of flux.
- c. They can all be used as solder.
- d. They are all types of metal that can be welded together.

20. Which of the following tools would be best to drill precisely placed holes to a specific depth?

- a. an awl
- b. a chisel
- c. a hand drill
- d. a drill press

- 21.** What type of gauge uses units of rpm?
- a pressure gauge
 - a tachometer
 - a speedometer
 - a thermometer

- 22.** What type of outside energy source could be used to operate a pump?
- a battery
 - an internal combustion engine
 - an electric motor
 - all of the above

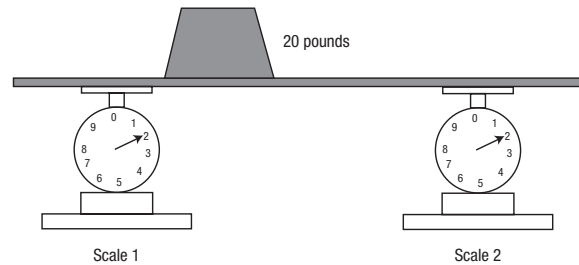
- 23.** Which of the following wrenches is adjustable?
- a crescent wrench
 - a pipe wrench
 - channel locks
 - all the above

- 24.** A ball-peen hammer is characterized by
- an elongated claw.
 - a rounded hemispherical head.
 - a stainless steel construction.
 - all the above

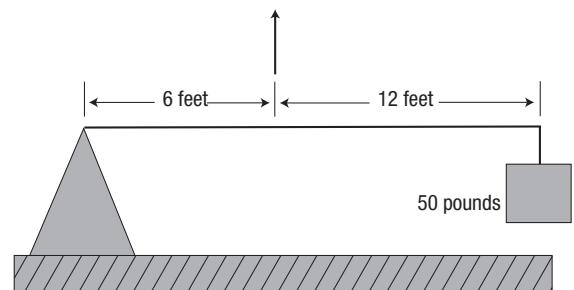
- 25.** A wood chisel is used for
- carving, cutting, or chipping.
 - slicing, dicing, or paring.
 - grinding or polishing.
 - prying.

Part 8: Mechanical Comprehension

Time: 19 minutes

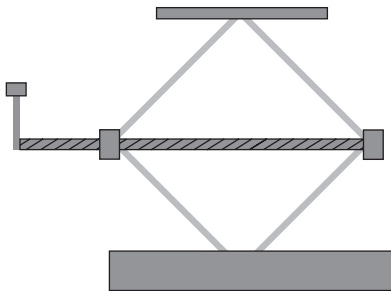


- 1.** According to the figure, assuming the board connecting scales 1 and 2 has no weight, how many pounds will scale 1 register?
- less than 10 pounds
 - 10 pounds
 - more than 10 pounds
 - impossible to determine

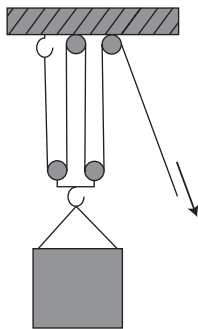


- 2.** In the diagram, Todd wants to lift a 50-pound block using a lever. If the block is 18 feet from the pivot point and Todd is 6 feet from the pivot point, how much force must he apply to lift the block?
- 100 pounds
 - 72 pounds
 - 150 pounds
 - 50 pounds

3. A hot air balloon is able to float because
- the hot air acts as a jet.
 - hot air is less dense than the outside air.
 - hot air is more dense than the outside air.
 - it is filled with helium.

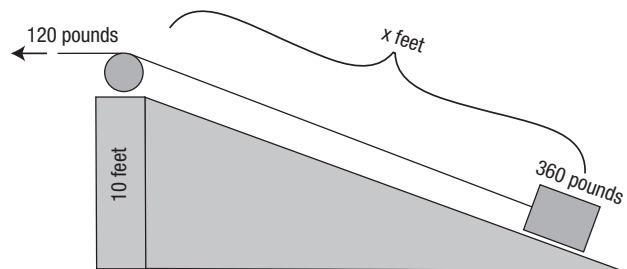


4. To change a tire, a person is able to take advantage of the mechanical advantage of a jack to lift a car. Each complete turn of the screw raises the car $\frac{1}{4}$ inch. If the handle travels 3 feet per revolution, what is the mechanical advantage of the jack?
- 12
 - 36
 - 14
 - 144

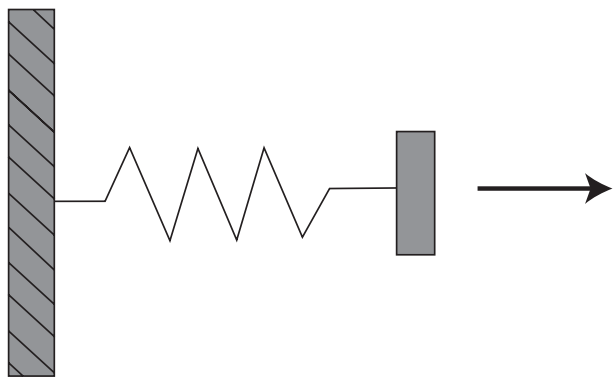


5. Bryan is strong enough to pull a rope with 150 pounds of force. Using the pulley system shown here, what is the maximum weight he can lift?
- 50 pounds
 - 300 pounds
 - 450 pounds
 - 600 pounds

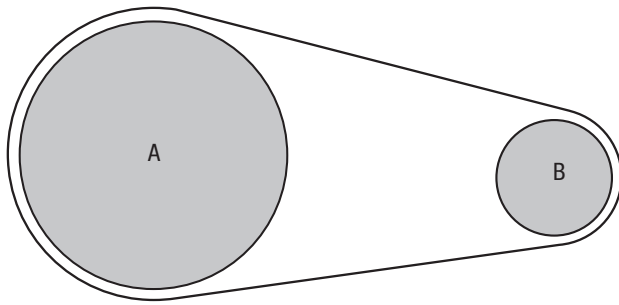
6. A wheelbarrow is loaded with 80 pounds of dirt. However, it can be lifted with only 20 pounds of force. What is the mechanical advantage of the wheelbarrow?
- 1
 - 2
 - 3
 - 4



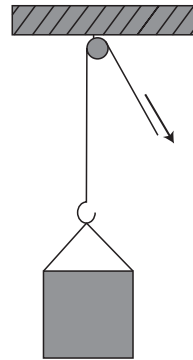
7. A 360-pound block is being pulled up an incline by a pulley. The incline rises 10 feet. Neglecting friction, if 120 pounds of force is necessary to move the block up the incline, how long is the incline?
- 30 feet
 - 360 feet
 - 20 feet
 - 60 feet



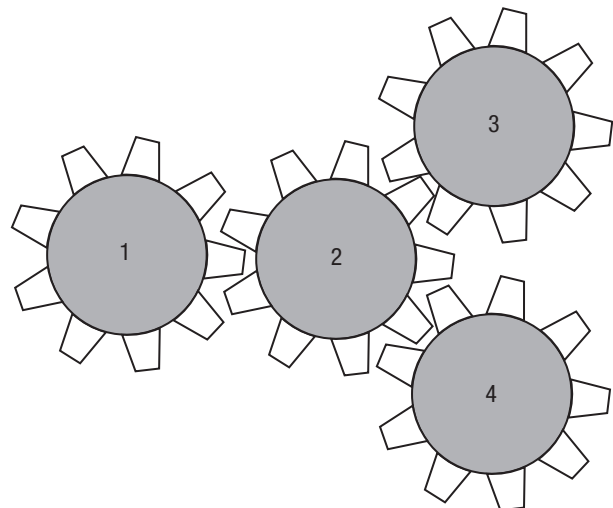
8. A spring has a force constant of 3 pounds per inch. How much force is required to move the spring 1 foot?
- 3 pounds
 - 12 pounds
 - 24 pounds
 - 36 pounds



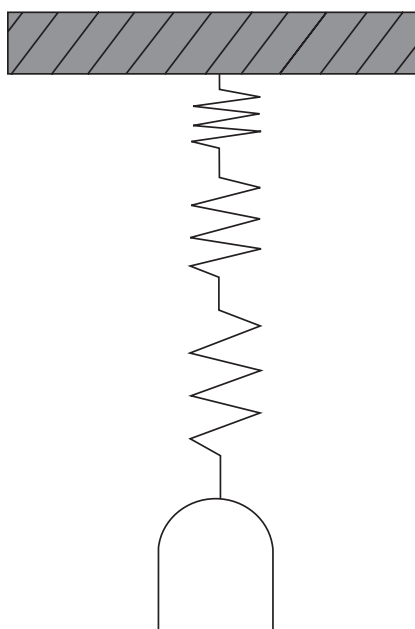
- 9.** Pulley A is three times the diameter pulley B. If pulley A rotates at 45 revolutions per minute (rpm), how fast must pulley B rotate?
- 15 rpm
 - 45 rpm
 - 90 rpm
 - 135 rpm
- 10.** A block of wood rests on a level surface. What mechanical principle makes it more difficult to push this block sideways if the surface is made of sandpaper than if it is made of glass?
- centrifugal force
 - gravity
 - wind resistance
 - friction
- 11.** A screw has 6 threads per inch. How many full turns are necessary for the nut to travel 2 inches?
- 6 turns
 - 12 turns
 - 18 turns
 - 24 turns
- 12.** When you add water to a tank, the water pressure at the top will
- change with the water depth.
 - decrease.
 - stay the same.
 - increase.



- 13.** What is the mechanical advantage of the pulley system shown here?
- 1
 - 2
 - 3
 - 4
- 14.** A block made of what material will float on water?
- metal
 - glass
 - styrofoam
 - rock



- 15.** If gear 1 turns clockwise, which other gear(s), if any, will also turn clockwise?
- 2 only
 - 3 only
 - 3 and 4 only
 - 2, 3, and 4



16. A handle is connected to the ceiling by a series of springs with force constants of 400, 200, and 100 pounds per inch. When a 200-pound soldier hangs from the handle, how many inches does the platform stretch?

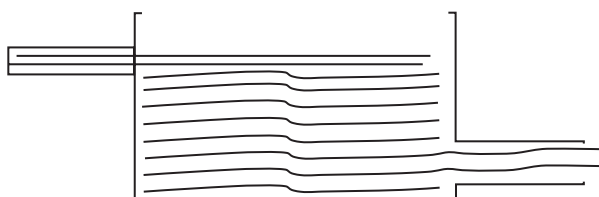
- a. 2 inches
- b. 2.5 inches
- c. 3 inches
- d. 3.5 inches

17. Matt leaves his barracks and travels east at 45 mph. At the same time, Phil leaves the same barracks and travels west at 35 mph. After 2 hours, how far away from each other will they be?

- a. 20 miles
- b. 80 miles
- c. 135 miles
- d. 160 miles

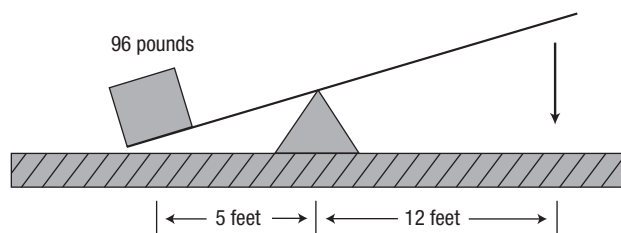
18. Two men are racing on bicycles. Both have 52-tooth front chain rings. One has a 12-tooth rear cog and the other has a 14-tooth rear cog. If the first bike is being pedaled at 60 rpm, how fast must the other bicycle be pedaled to keep up?

- a. 60 rpm
- b. 70 rpm
- c. 80 rpm
- d. 90 rpm



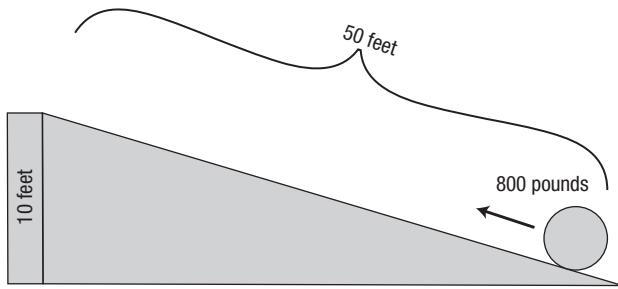
19. Water is flowing into a 20-gallon container through an inlet pipe at a rate of 18 gallons per minute. Water is being evacuated through an outlet at 14 gallons per minute. How much time will it take for the container to overflow?

- a. 1 minute
- b. 5 minutes
- c. 8 minutes
- d. 10 minutes

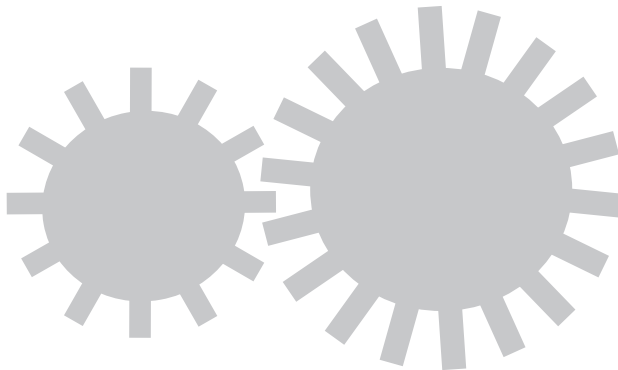


20. In the diagram, James wants to lift a 96-pound block using a lever. If the block is 5 feet from the pivot point and James is 12 feet from the pivot point, how much force must he apply to lift the block?

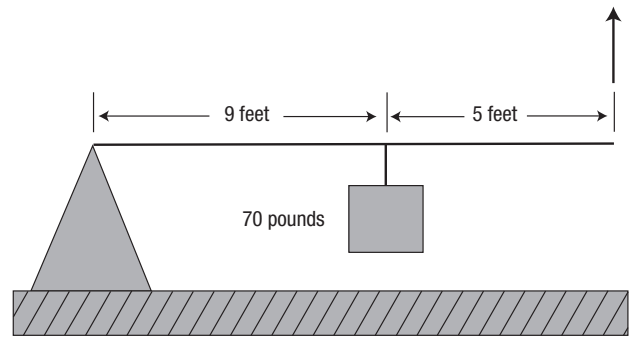
- a. 40 pounds
- b. 17 pounds
- c. 96 pounds
- d. 60 pounds



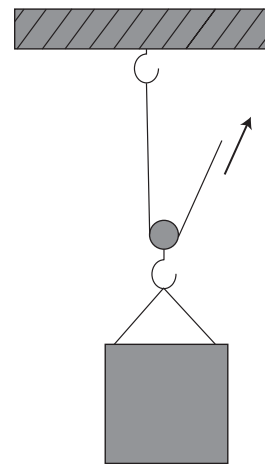
- 21.** An 800-pound block is being pulled up an incline by a pulley. The incline is 50 feet long and rises 10 feet. Neglecting friction, how much force is necessary to move the block up the incline?
- 50 pounds
 - 160 pounds
 - 800 pounds
 - 60 pounds



- 22.** Two gears have 12 teeth and 18 teeth. If the larger gear completes two full turns, how many rotations will the smaller gear complete?
- 1 rotation
 - 1.5 rotations
 - 2 rotations
 - 3 rotations
- 23.** Using the tip of a screwdriver to pry the lid off a paint can is an example of what simple machine?
- lever
 - pulley
 - inclined plane
 - gear



- 24.** In the diagram, Stevi wants to lift a 70-pound block using a lever. If the block is 9 feet from the pivot point and Stevi is 5 feet beyond that, how much force must she apply to lift the block?
- 45 pounds
 - 14 pounds
 - 126 pounds
 - 70 pounds

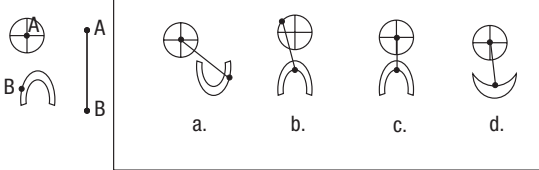
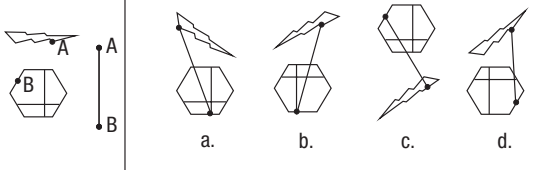
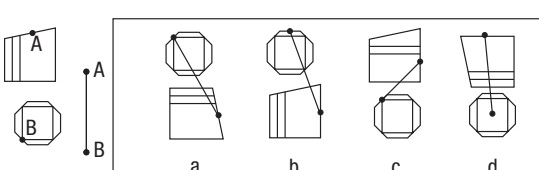
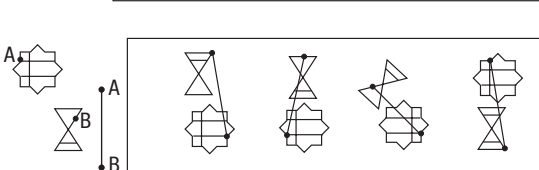
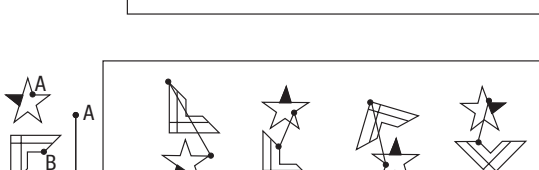


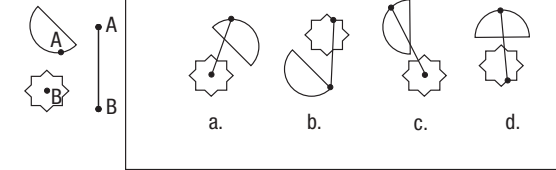
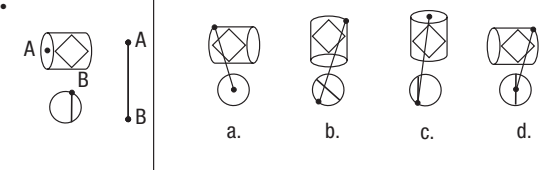
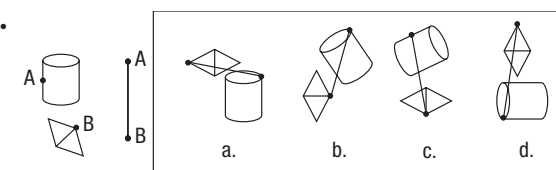
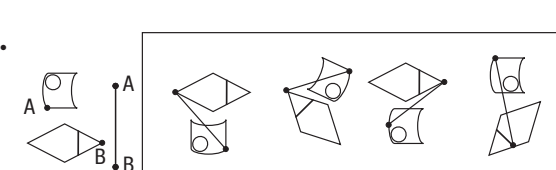
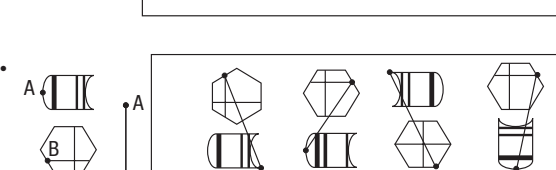
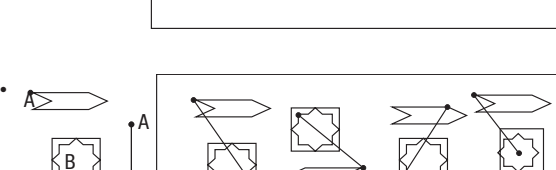
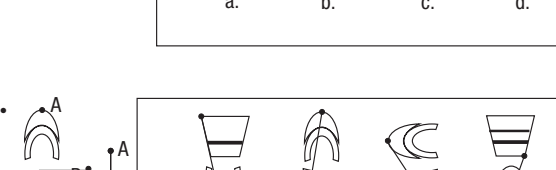
- 25.** Using the pulley system shown here, how much force is required to lift a 150-pound weight?
- 25 pounds
 - 50 pounds
 - 75 pounds
 - 100 pounds

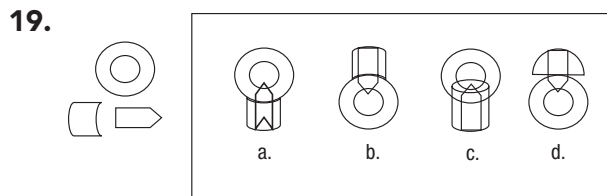
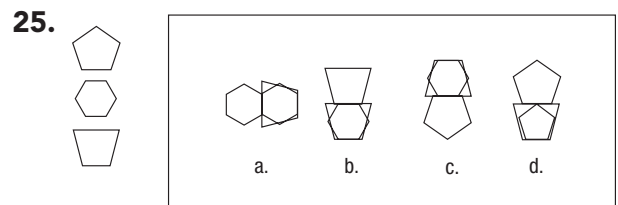
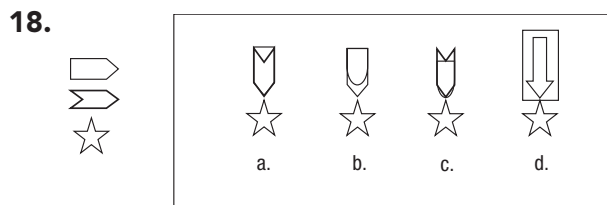
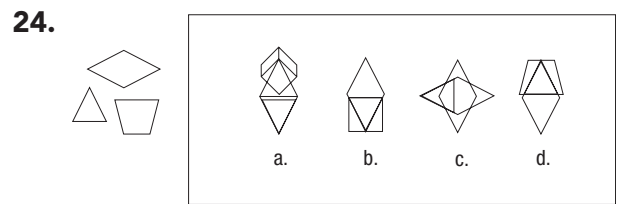
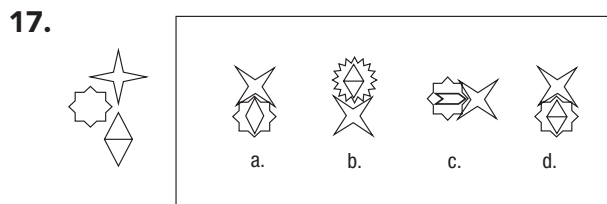
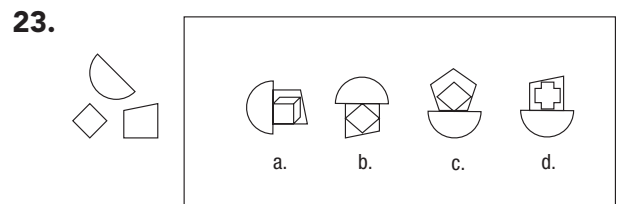
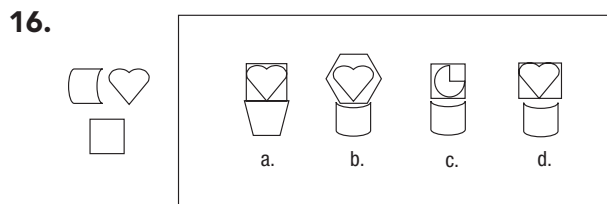
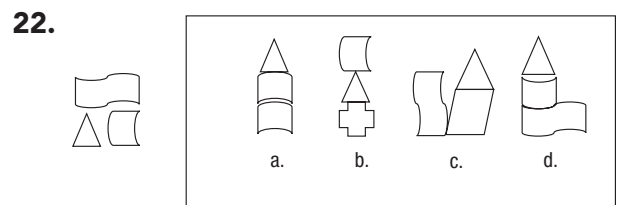
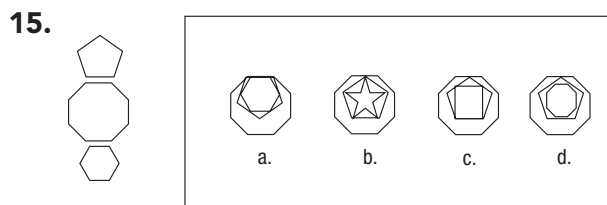
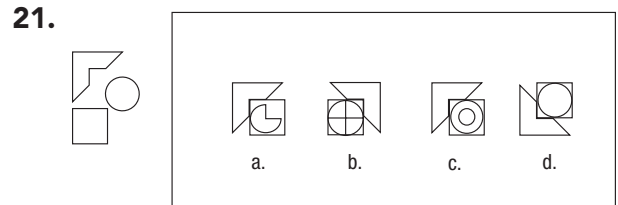
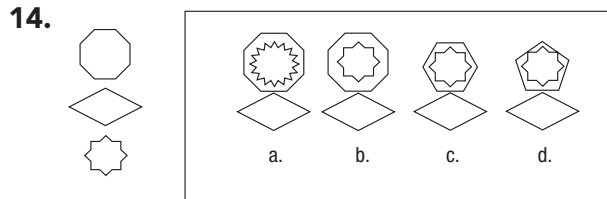
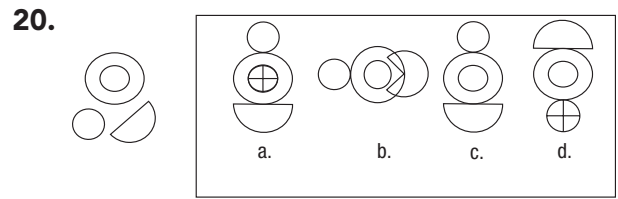
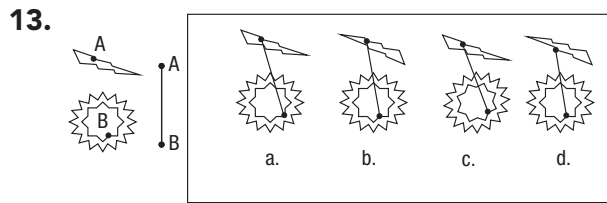
Part 9: Assembling Objects

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. 
4. 
5. 

6. 
7. 
8. 
9. 
10. 
11. 
12. 



Answers

Part 1: General Science

1. d. Earth is the third planet from the Sun and Mars is the fourth planet and next farthest from the Sun.
2. b. Animal cells do not have cell walls; plant cells do. Animals do exist with the remaining traits.
3. a. Only A-U is a possible human nucleotide pairing, which represents the pairing in RNA between adenosine (A) and uracil (U).
4. b. Convection is the process of transferring heat by moving a fluid in a space, much like a convection oven uses a fan to distribute heat within the oven.
5. c. Velocity is the change in distance over time ($v = \frac{d}{t}$).
6. d. Charles's Law states that a volume of gas maintained at constant pressure is directly proportional to its temperature. Therefore, when the temperature increases so does the volume by the same factor.
7. a. mRNA is responsible for taking the genetic code from DNA out of the nucleus into the cytoplasm of the cell.
8. d. Ribosomes are structures that are present in all cells and are responsible for producing proteins.
9. c. When a substance sublimates, it changes state from a solid to a gas without changing into a liquid first.
10. b. Meiosis results in daughter cells that are genetically different from their parent cell. This leads to greater diversity when compared to reproduction through mitosis or asexual reproduction.
11. a. Chloroplasts contain chlorophyll, which gives plants their green color in leaves and makes photosynthesis possible.
12. d. The force applied to an object is determined by the product of its mass and acceleration ($F = ma$). Therefore, the force on an object weighing 30 kg accelerating at $15\frac{m}{s^2}$ is 450 N ($30 \times 15 = 450$).
13. c. A 0.200 M solution of NaOH contains 0.05 mol NaOH. This is calculated by:

$$\frac{0.200 \text{ mol NaOH}}{1 \text{ L}} \times 250 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} =$$

$$0.050 \text{ mol NaOH} \times \frac{40 \text{ g NaOH}}{1 \text{ mol}} = 2.00 \text{ g NaOH}$$
14. b. All cells undergo mitosis to reproduce into identical cells with the same DNA. Cells specialize into different tissue by expressing different parts of their DNA. Only gametes may have different DNA from their parent cells due to meiosis.
15. a. Subduction is when one plate slides underneath another and is the location of earthquakes, fault lines, and deep ocean trenches.
16. d. Sound waves are created by the vibration of matter and make changes in the pressure of the medium in which sound travels. In a vacuum there is no pressure, so sound cannot exist in a vacuum and its speed would be zero.
17. d. Veins carry blood to the heart and arteries carry blood away from the heart. Pulmonary refers to the lungs.
18. a. One of the primary functions of the liver is to process toxins absorbed in the digestive system.
19. c. Electrical current is measured by the unit ampere, which is electrical charge per second.

- 20. c.** To form an anion an element needs to reduce or accept an electron. Electronegativity describes an element's ability to accept electrons and in general electronegativity increases moving from left to right and decreases from top to bottom in the periodic table. Therefore, from this list the element with the least electronegativity would be P.
- 21. a.** Natural selection occurs through genetic traits passed on to offspring that are beneficial to survival, like adapting to harsh climates or living with limited resources. Traits learned by parents are not passed on to generations of offspring.
- 22. d.** An ecosystem is the community of species in a habitat and the environmental factors interacting with the community. Biosphere and biome are too large scale for this question.
- 23. b.** Transport systems in plants is a unique characteristic of vascular plants, otherwise known as tracheophytes.
- 24. a.** This is a double replacement reaction where the cations and anions switch to form new molecules.
- 25. a.** The second energy level can hold up to 8 electrons.
- 3. a.** The train's speed can be found using the formula $Distance = rate \times time$. From this we get the formula $rate = \frac{distance}{time}$, since we are looking for the speed. By substituting, $rate = \frac{300}{6}$, which simplifies to 50. The speed is 50 miles per hour.
- 4. b.** To find the percentage of people who said they rode at least three times a week, divide 105 by 150: $105 \div 150 = 0.7$, which is 70%. $0.7 \times 100,000 = 70,000$.
- 5. d.** According to the table, a pound in weight makes a difference of \$0.64, or \$0.04 per ounce over 4 pounds. Fruit that weighs 4 pounds 8 ounces will cost 8×0.04 or \$0.32 more than fruit that costs 4 pounds. Therefore, the cost is $\$1.10 + 0.32 = \1.42 .
- 6. b.** To find the answer, begin by adding the cost of the two sale puppies: $\$15 + \$15 = \$30$. Now subtract this amount from the total cost: $\$70 - \$30 = \$40$ paid for the third puppy.
- 7. b.** First, divide to determine the number of 20-minute segments there are in 1 hour: $60 \div 20 = 3$. Now multiply that number by the number of times Rita can circle the block: $3 \times 5 = 15$.
- 8. c.** Between 8:14 and 9:00, 46 minutes elapse, and between 9:00 and 9:12, 12 minutes elapse, so this becomes a simple addition problem: $46 + 12 = 58$.
- 9. a.** Let x equal the number of pounds of chocolate to be mixed. You know the mixture's total cost is the cost of the chocolates plus the cost of the caramels, or $M = A + B$. In terms of x , $M = 3.95(x + 3)$, $A = 5.95x$, while $B = 2.95(3)$. Combine terms: $3.95(x + 3) = 5.95x + 2.95(3)$. Simplify: $3.95x + 11.85 = 5.95x + 8.85$, or $11.85 - 8.85 = (5.95 - 3.95)x$, which becomes $2x = 3$. Thus, $x = 1.5$ pounds.
- 10. c.** This is a problem of addition. You may simplify the terms: $M = F + 10$; then substitute: $M = 16 + 10$, or 26.

Part 2: Arithmetic Reasoning

- 1. b.** The total number of pages assigned is 80; $\frac{1}{6} \times 80 = \frac{8}{3}$ or $13\frac{1}{3}$.
- 2. c.** This is a three-step problem involving multiplication, subtraction, and addition. First, find out how many fewer minutes George jogged this week than usual: 5 hours \times 60 minutes = 300 minutes – 40 minutes missed = 260 minutes jogged. Now add back the number of minutes George was able to make up: 260 minutes + 20 + 13 minutes = 293 minutes. Now subtract again: 300 minutes – 293 = 7 minutes jogging time lost.

- 11. d.** First, add the weight of Ralph's triplets: $4\frac{3}{8} + 3\frac{5}{6} + 4\frac{7}{8}$, or (after finding the least common denominator) $4\frac{9}{24} + 3\frac{20}{24} + 4\frac{21}{24} + 11\frac{50}{24}$, or $13\frac{2}{24}$, or $13\frac{1}{12}$. Now find the weight of Harvey's twins: $7\frac{10}{30} + 9\frac{9}{30} = 16\frac{19}{30}$. Now subtract: $16\frac{19}{30} - 13\frac{1}{12} = 16\frac{38}{60} - 13\frac{5}{60} = 3\frac{33}{60} = 3\frac{11}{20}$. So Harvey's twins outweigh Ralph's triplets by $3\frac{11}{20}$ pounds. (No further reduction of the fraction is possible.)
- 12. d.** There are four quarters for every dollar; $\$12 \times 4$ quarters per dollar = 48 quarters.
- 13. c.** From 5:16 P.M. to 7:16 A.M. the next day is 14 hours. An additional 42 minutes occurs between 7:16 A.M. and 7:58 A.M.: $(58 - 16 = 42)$.
- 14. b.** Carmella worked 15 hours per week for 8 weeks: $15 \times 8 = 120$. In addition, she worked 15 hours for Mariah for one week, so $120 + 15 = 135$.
- 15. c.** Take apart the statement and translate each part. The word *twice* tells you to multiply the quantity by two. In the second part of the statement, the word *sum* is a key word for addition. So *the sum of six and four* is translated as $6 + 4$. The whole statement becomes $2(6 + 4)$.
- 16. c.** Divide the amount of cod by the number of crates: $400 \div 20 = 20$.
- 17. c.** The speed of the train, obtained from the table, is 60 miles per hour. Therefore, the distance from Chicago would be equal to $60t$. However, as the train moves on, the distance decreases from Los Angeles, so there must be a function of $-60t$ in the equation. At time $t = 0$, the distance is 2,000 miles, so the function is $2,000 - 60t$.
- 18. b.** Divide \$350 by \$25; $350 \div 25 = 14$ weeks.
- 19. d.** This is a division problem. First, change the mixed number to a fraction: $3\frac{1}{2} = \frac{7}{2}$. Next, invert $\frac{1}{8}$ and multiply: $\frac{7}{2} \times \frac{8}{1} = 28$.
- 20. b.** The total value of the supplies and instruments is found by adding the cost of each item: $1,200 + (2 \times 350) + (3 \times 55) + 235 + 125 + 75 = 1,200 + 700 + 165 + 235 + 125 + 75$. The total is \$2,500.
- 21. d.** If Salwa (S) is 10 years older than Roland (R), then S is equal to $R + 10$. Therefore, the equation is $S = R + 10$.
- 22. c.** January is approximately \$38,000; February is approximately \$41,000; and April is approximately \$26,000. These added together give a total of \$105,000.
- 23. b.** Visualize a number line. The drop from 31° to 0° is 31° . They are still nine more degrees to drop. They will be below zero, so -9°F is the temperature at midnight.
- 24. a.** This answer is in the correct order and is "translated" correctly: Rachel had (=) 3 apples and ate (-) 1.
- 25. d.** Each number is divided by 2 to find the next number: $40 \div 2 = 20$, so 20 is the next number.
- 26. c.** First you must subtract the percentage of the installation cost during construction (1.5%) from the percentage of the installation cost after construction (4%). To do this, begin by converting the percentages into decimals: $4\% = 0.04$; $1.5\% = 0.015$. Now subtract: $0.04 - 0.015 = 0.025$. This is the percentage of the total cost that the homeowner will save. Multiply this by the total cost of the home to find the dollar amount: $0.025 \times \$150,000 = \$3,750$.
- 27. b.** First, simplify the problem: $K = 5 \times 17 = 85$, so Kara made 85 cents; $R = 7 \times 14 = 98$, so Rani made 98 cents, the higher amount of money; $R - K = 98 - 85 = 13$. Therefore, Rani made 13 cents more than Kara.

28. d. Because Linda pays with a check only if an item costs more than \$30, the item Linda purchased with a check in this problem must have cost more than \$30. If an item costs more than \$30, then it must cost more than \$25 (choice **d**), as well.

29. d. First, write the problem in columns:

$$\begin{array}{r} 6 \text{ feet } 5 \text{ inches} \\ -5 \text{ feet } 11 \text{ inches} \\ \hline \end{array}$$

Now subtract, beginning with the rightmost column. Since you cannot subtract 11 inches from 5 inches, you must borrow 1 foot from the 6 in the top left column, then convert it to inches and add: 1 foot = 12 inches; 12 inches + 5 inches = 17 inches. The problem then becomes:

$$\begin{array}{r} 5 \text{ feet } 17 \text{ inches} \\ -5 \text{ feet } 11 \text{ inches} \\ \hline 6 \text{ inches} \end{array}$$

So the answer is choice **d**, 6 inches.

30. a. To find the fraction, compare the down payment with the total cost of the car; $630/6,300$ reduces to $\frac{1}{10}$.

Part 3: Word Knowledge

- 1. b.** *Lure* means to entice, tempt, or attract.
- 2. a.** *Delirious* means marked by frenzied excitement, or manic.
- 3. c.** *Infirm* means feeble, unsound, or weak.
- 4. b.** Something *perilous* involved great risk or danger.
- 5. c.** *Isolation* means the state of being alone or withdrawn, or solitude.
- 6. a.** A *lull* is a temporary pause.
- 7. d.** To *outfit* means to supply or to furnish.
- 8. b.** To *omit* means to leave out, fail to perform, or neglect.
- 9. a.** *Mutiny* means resistance to lawful authority, or rebellion.
- 10. c.** *Naïve* means unaffectedly simple, or unsophisticated.
- 11. d.** *Rudimentary* means crude or primitive.
- 12. a.** *Pompous* means self-important, or arrogant.
- 13. a.** *Prevalent* means generally accepted, or widespread.
- 14. c.** *Abundance* means an ample quantity, or wealth.
- 15. d.** A *calamity* is an extraordinarily grave event, or disaster.
- 16. b.** *Superficial* means to be concerned only with the surface or appearance, or shallow.
- 17. d.** To *reform* means to change for the better, or to correct.
- 18. c.** *Methodical* means proceeding according to an order or system, or systematic.
- 19. d.** *Spite* means petty ill will or hatred, or malice.
- 20. a.** When used as a verb, *scale* means to climb.
- 21. c.** A *smudge* is a blurry spot or streak.
- 22. b.** One meaning of to *drizzle* is to rain in very small drops, or to sprinkle.
- 23. b.** *Mundane* means ordinary, or commonplace.
- 24. b.** *Mirth* means gladness expressed with laughter, or glee.
- 25. c.** *Drudgery* means uninspiring or menial behavior.
- 26. a.** *Prerequisite* means necessary for carrying out a function.
- 27. a.** *Caustic* means biting sarcasm or cutting; able to burn or dissolve by chemical action. The main context clue is that people find Gerard's jokes upsetting rather than humorous.
- 28. d.** *Enigma* means something that is puzzling or difficult to understand; a baffling problem or riddle. The context tells you that people know who Sandra is, but no one knows anything about her; thus, she remains a mystery.

- 29. d.** To *garner* means to acquire, amass, or gather. The sentence tells you that Ilona quickly found the support she needed to present her idea to the committee; also, because the sentence states that people loved Ilona's idea, it is logical to conclude that she would gather their support.
- 30. b.** To *thwart* means to stop, or prevent the accomplishment or realization of something. Hattie's twisted ankle kept her from realizing her attempt to complete the marathon.
- 31. d.** *Trite* means repeated too often, overly familiar through overuse. The key context clue is the phrase "the old storyline," which indicates that the plot of the movie is overused.
- 32. b.** *Diligently* means attentively, painstakingly, or dutifully. Anthony is described as meticulous, which means careful and attentive.
- 33. c.** *Reticent* means restrained, uncommunicative, or reluctant. The key word here is *although*, because it tells you that first Hunter was quiet, but then later became very talkative.
- 34. a.** *Legitimate* means genuine, in accordance with law, or lawful. Because the deceased is a relative the claim to her estate is justified.
- 35. b.** To *facilitate* something is to help it along, encourage, or assist. By placing garbage bins around the park, the committee leader is helping the cleanup process.
- 3. d.** The word *pantheon* comes from the Greek words *pan*, meaning all, and *theos*, meaning gods. Thus, *pantheon* means "all gods," and refers to a list of ancient deities.
- 4. a.** The passage addresses the names of weekdays, demonstrating that they are drawn from ancient gods. Therefore, one can safely conclude that mythology played a role in the development of the English language. The other choices may or may not be true, but they are not sufficiently addressed in the passage to draw an accurate inference.
- 5. a.** The passage states that the word *linoleum* comes from the Latin words *linum* and *oleum*.
- 6. d.** The passage does mention that linoleum is used around the world and that it is named from Latin words, but the main idea is to discuss the floor covering's history.
- 7. d.** Choices **a** and **c** are not supported by the paragraph. Choice **b** only tells us about particular parts of the paragraph and is too specific to be the main idea. Choice **d**, however, is general enough to encompass all the sentences and the paragraph as a whole. Every sentence supports the idea asserted in choice **d**.
- 8. b.** The last sentence states that Priority Mail will deliver a package in two days or less. Express Mail gets a package delivered overnight, while the other options are not addressed in the passage.
- 9. b.** The author does not specifically state that paper clips are a useful invention, but the enthusiastic tone of the passage suggests it. The author's list of uses for paper clips reinforces this tone.
- 10. a.** The word *crevice* refers to a crack or fracture, such as crevices in rocks.

Part 4: Paragraph Comprehension

- 1. a.** Each of the choices is mentioned in the passage, but only **a** states the overall theme or central idea of the passage. The other choices are details of that central idea.
- 2. c.** The passage states that Wednesday is named after Woden, a god associated with musical inspiration. The other choices are not supported in the passage.

- 11. c.** The last sentence of the passage lists several things that people once used to bind papers together, which included string. The other items are not listed.
- 12. b.** The second paragraph does state that Vaaler was a Norwegian, but he patented his idea with the German patent office, so choice **b** is the correct answer.
- 13. d.** The directions mention nothing about fertilization.
- 14. c.** The third sentence specifically mentions that the pointed side goes up and the root side faces down. This means that there is an up side and a down side and that it is possible for the bulb to be put into the soil upside down if someone didn't know better. The other choices may be true, but are not mentioned in the passage.
- 15. a.** The passage states that the color-coding of garbage is important for the safety of all personnel, so choice **d** is not correct. The other choices are not addressed in the passage.
- 6. c.** If the pentagons are similar, then the sides are in proportion. Because AB is similar to FG , and $AB = 10$ and $FG = 30$, the second pentagon is three times as large as the first pentagon. Therefore, HI is three times as large as CD , which gives a length of 15.
- 7. c.** A trapezoid by definition is a quadrilateral with exactly one pair of parallel sides.
- 8. b.** To find the greatest common factor of $3x^2$, $12x$, and $6x^3$ first start with the coefficients, or numbers in front of the variables. The largest number that divides into 3, 6, and 12 without a remainder is 3. With the variables, the smallest exponent on x is 1, so x^1 , or x , is the largest variable factor. Therefore, the greatest common factor of all three terms is $3x$.
- 9. b.** Because the integers must be even, the equation $n + (n + 2) + (n + 4) = 30$ is used. This gives $3n + 6 = 30$; $3n = 24$; $n = 8$. Therefore, 8 is the first number in the series. Choice **a**, (9, 10, 11) would work, but the numbers aren't even integers.
- 10. b.** To convert a decimal to a percent, multiply the decimal by 100, or move the decimal point two places to the right. Therefore, 6.0% is the correct answer.
- 11. b.** Simply set up the equation in the manner in which the problem is written. Since $x\% = \frac{x}{100}$, the equation is $\frac{x}{100} = \frac{0.40}{1.30}$. Cross multiply: $1.30x = (0.40)(100)$. Simplify: $x = \frac{40}{1.30}$. Thus, $x = 30.7$, which means that \$0.40 is about 31% of \$1.30.
- 12. c.** A right angle is exactly 90° .
- 13. d.** In order to form a triangle, the sum of the two shortest sides must be greater than the longest side. In choice **d**, the two shortest sides are 2 and 2; $2 + 2 = 4$, which is greater than the largest side of 3.
- 14. b.** A cube has four sides, a top, and a bottom, which means that it has six faces.

Part 5: Mathematics Knowledge

- 1. d.** Subtract 5 from 25 to get 20. Then, multiply 20 by 5 to find the correct answer of 100.
- 2. d.** There are four sides measuring 4, and two sides measuring 8. Therefore, the perimeter is $(4 \times 4) + (2 \times 8) = 32$.
- 3. b.** The root *cent* means 100 (think of the word *century*), so the word *percent* literally means "per 100 parts." Thus 25% means 25 out of 100, which can also be expressed as a ratio: 25:100.
- 4. a.** To find the square root of a number, ask the question, "What number times itself equals 64?" The answer is 8.
- 5. c.** $76 \div 19 = 4$; the other division operations will not end in whole numbers.

- 15. c.** A prime number is a number that has exactly two factors, 1 and itself. Each of the number choices has more than two factors except 11, whose only factors are 1 and 11.
- 16. c.** The fraction $\frac{32}{100}$ reduced to lowest terms is $\frac{8}{25}$.
- 17. b.** When you are performing addition or subtraction with roots, the terms can be combined only if the radicands (numbers under the square root symbols) are the same. In this case, the radicands are both 2. Subtract the whole numbers in front of the square roots and keep the $\sqrt{2}$. Then, $16 - 4 = \sqrt{12}$, so the final answer is $12\sqrt{2}$.
- 18. c.** Since 45 is nine times larger than five in the denominators, convert to an equivalent fraction by multiplying 2 by 9 to get the resulting numerator: $2 \times 9 = 18$, so $x = 18$. Another way to solve this problem is to cross multiply to get $5x = 90$. Divide both sides of the equation by 5 to get $x = 18$.
- 19. a.** All of the angles are acute, and all are different. Therefore, the triangle is acute scalene.
- 20. d.** The correct answer to this simple addition problem is 1.268.
- 21. c.** The greatest area from a quadrilateral will always be a square. Therefore, a side will be $24 \div 4 = 6$ feet. The area is $6^2 = 36$ square feet.
- 22. a.** The correct answer is 5.
- 23. c.** The bars on either side of -14 indicate the absolute value of -14 . The absolute value of a number is its distance away from zero on a number line and, in this case, is 14. Therefore, $14 + -5 = 9$. Since the signs are different, subtract and keep the sign of the larger number.
- 24. c.** Ten times 10 times 10 is 1,000. One thousand times 7.25 is 7,250.
- 25. c.** First ask how many inches are in one foot; the answer is 12 inches. Now multiply: $12 \times 4 = 48$ inches.

Part 6: Electronics Information

- 1. c.** Data stored on magnetic tape can be lost by exposure to heat; damage can also be done by stretching the tape or by exposure to other magnetic fields.
- 2. b.** Current is the *rate at which* an electrical charge passes a specific point in a circuit.
- 3. d.** In a series circuit, the total resistance is the sum of each resistor value. $7 \text{ resistors} \times 67\Omega = 469\Omega$.
- 4. b.** In a parallel circuit, the total resistance is the value of a single resistor.
- 5. a.** The symbol actually shows a single-pole 4-way switch.
- 6. a.** Ohms is the resistance of the current and amperes is the strength of the current.
- 7. c.** AC stands for alternating current.
- 8. b.** DC stands for direct current.
- 9. d.** The coating process used in electroplating is known as *electrodeposition*.
- 10. c.** This is the schematic symbol for a lamp.
- 11. d.** RMS stands for root mean square, which is the peak value of voltage multiplied by 0.707.
- 12. b.** This is the schematic symbol for a battery.
- 13. a.** The velocity of radio waves radiated into free space is 300,000,000 meters per second, which is the speed of light. Choice **c**, 343 meters per second, is the speed of sound.
- 14. d.** Volts = ohms \times amps. $V = 10 \times 20$. $V = 200$.
- 15. b.** Water is not an insulator. Rubber is another insulator not listed in the choices.
- 16. c.** Dielectric heating is the process by which a dielectric material is subjected to a rapidly altering electrical field. Heat is generated as the radio wave or microwave electromagnetic radiation heats the material.
- 17. a.** A zener diode is used to regulate voltage. A photodiode (**b**) converts light to electricity, a capacitor (**c**) stores electricity, and a light emitting diode (**d**) converts electricity to light.
- 18. d.** This is the schematic symbol for a ground.

19. c. The neutral wire is white or silver in 120-volt wiring in the United States. The hot or live wire can be black, red, blue, or brass. Orange or yellow wire is often used for input signals.
20. b. Watts = amps \times volts. $W = 30 \times 120$.
 $W = 3,600$.

Part 7: Auto and Shop Information

1. b. The gauge abbreviation “PSI” stands for “pounds per square inch.”
2. c. The circulation of coolant through the engine block picks up waste heat generated by the operation of the engine. This hot coolant is routed back to the radiator where the passage of ambient air over the radiator grill cause the coolant to exchange heat.
3. a. Overinflated tires would result in the center part of the tread contacting the road more often than the outer, side surfaces. Underinflated tires would show excessive tread wear on the outer edges because the weight of the automobile makes more of the tire surface contact the road.
4. b. Poor or malfunctioning shock absorbers could result in an extremely bouncy ride, as the suspension springs absorb the bumps in the road but the shock absorbers do not dampen out this spring movement.
5. a. The job of the water pump is to circulate coolant throughout the engine’s cooling system.
6. b. The job of the crankshaft is to convert the up-and-down motion of the pistons and tie rods into the rotational movement of the driveshaft.
7. d. The differential is located in the drive axle. This allows the wheels to turn at different speeds as a car rounds corners.
8. d. The purpose of a camshaft in an internal combustion engine is to transfer energy to the drivetrain.
9. b. A caliper is a tool with which one can obtain precise measurements between two opposing objects. Vernier calipers use the highly precise Vernier measurement scale to gain an even more precise measurement.
10. a. The transmission system uses specialized transmission fluid to ensure the elements involved in the automobile transmission are lubricated.
11. c. An automobile’s electrical system uses the alternator to recharge the battery.
12. d. Spark plugs provide the spark to ignite the air/fuel mixture during the power cycle of the internal combustion engine operation.
13. b. The cooling fluid used is typically a mixture of water and ethylene glycol ($C_2H_6O_2$), the former for its ability to retain heat and the latter for improving the boiling and freezing points as necessary.
14. d. A plumber looking to turn soft iron pipes or fittings with a rounded surface would most likely use a pipe wrench.
15. d. Four inches is equal to 16 quarter inches. Each quarter inch is 2 feet, so 16 quarter inches is 32 feet.
16. c. Each 9-foot wall has an area of $9(8)$, or 72 square feet. There are two such walls, so those two walls combined have an area of 144 square feet. Each 11-foot wall has an area of $11(8)$ or 88 square feet, and again there are two such walls: $88(2) = 176$. Finally, add 144 and 176 to get 320 square feet.
17. c. A vise has an adjustable grip that can be used to securely hold a piece of wood or other material, allowing the carpenter more freedom to perform work that could require both hands and a steady, secure material.
18. a. A winch is a mechanical device used to hoist, haul, or pull an item. A level, a compass, and a chisel are all tools that are used by a carpenter’s hand in his work.

19. b. Ammonium chloride, rosin, hydrochloric acid, zinc chloride and borax are all common types of flux, necessary to remove oxidation from the metals to be welded together.
20. d. A drill press can be set to drill to a specific depth and is mounted to a rig allowing for precise placement of the drill bit.
21. b. A tachometer would typically use units of revolutions per minute (rpm) as a measurement. A pressure gauge would typically use pounds per square inch (psi), a speedometer would typically use miles per hour (mph) or kilometers per hour (kph), and a thermometer would typically use degrees Fahrenheit or Celsius.
22. d. All the selections are used to power various pumps. A battery is used to power a portable sump pump, an internal combustion engine is used to power a number of pumps in an automobile (e.g., oil pump, fuel pump) and an electric motor powers pumps used in places like water wells or pools.
23. d. A crescent wrench, a pipe wrench, and channel locks are all adjustable wrenches.
24. b. The ball-peen hammer, typically used in metalworking, has a rounded hemispherical head as one of its usable ends.
25. a. A wood chisel is used for carving, cutting, or chipping wood.
4. d. Mechanical advantage describes the factor that force is multiplied by a simple machine. Here, by moving the screw handle 3 feet (3 feet \times 12 inches per foot = 36 inches), the jack is raised $\frac{1}{4}$ inch. Thus the mechanical advantage of the jack is $36 \div \frac{1}{4} = 144$.
5. d. A pulley system of this type has a mechanical advantage of 4. So, if Bryan can pull a rope with 150 pounds of force, he will be able to lift a weight of $150 \text{ pounds} \times 4 = 600$ pounds.
6. d. Mechanical advantage = output force \div input force. Here, 20 pounds of force is input to lift 80 pounds of dirt. The mechanical advantage is $80 \div 20 = 4$.
7. a. Mechanical advantage (MA) is the factor by which a simple machine multiplies for the force put into it. In this case, 120 pounds of force is used to move a 360-pound block, so $MA = 360 \div 120 = 3$. The MA of a ramp is determined by the length of the ramp, l , divided by the height gained, h . In this case, $MA = 3 = \frac{l}{h} = \frac{l}{10}$ feet. Solving for l tells us the ramp is 30 feet long.
8. d. The force required to stretch a spring is equal to its force constant multiplied by the distance stretch ($F = kx$). The force required to move a spring with a force constant of 3 pounds per inch a distance of 12 inches is $3 \times 12 = 36$ pounds.
9. d. Since pulley A is three times greater in diameter than pulley B, each revolution of A will lead to 3 revolutions of B. If A rotates at 45 rpm, then B will rotate at $45 \text{ rpm} \times 3 = 135$ rpm.
10. d. Friction is the force that must be overcome in order to slide on object across another.
11. b. There are 6 threads per inch. To move the nut 2 inches will require $6 \times 2 = 12$ turns.

Part 8: Mechanical Comprehension

1. c. The 20-pound block is located closer to scale 1 than scale 2. Scale 1 will support more than half the weight of the block.
2. c. $w_1 \times d_1 = w_2 \times d_2$. Todd is 6 feet away from the pivot point, and the block is 18 feet away. $50 \times 18 \text{ feet} = 6 \text{ feet} \times w_2$. Solving for w_2 gives 150 pounds.
3. b. When air is heated it expands and becomes less dense than cold air, making the entire balloon buoyant and allowing it to float.

- 12. c.** Water pressure at the bottom of a tank increases as the weight of water above it increases, but pressure at the top remains the same, since it has a finite amount of water above it.
- 13. a.** The entire weight is supported by a single cable and no mechanical advantage is achieved using this pulley system. So the mechanical advantage is 1.
- 14. c.** All other materials are denser than water and will sink. Styrofoam is not very dense and will float on water.
- 15. c.** Gear 1 turning clockwise will cause gear 2 to turn counterclockwise. In turn, this counterclockwise movement will cause gears 3 and 4 to turn clockwise.
- 16. d.** The 200-pound weight will stretch the first spring $200 \text{ pounds} \div 400 \text{ pounds per inch} = 0.5 \text{ inches}$. The second spring stretches $200 \text{ pounds} \div 200 \text{ pounds per inch} = 1 \text{ inch}$. The third spring stretches $200 \text{ pounds} \div 100 \text{ pounds per inch} = 2 \text{ inches}$. The total amount the platform compresses is therefore $0.5 + 1 + 2 = 3.5 \text{ inches}$.
- 17. d.** Since the two are traveling in opposite directions, the rate at which they move farther apart is equal to the sum of their two speeds ($35 \text{ mph} + 45 \text{ mph} = 80 \text{ mph}$). After 2 hours, the two will be $80 \text{ mph} \times 2 \text{ hours} = 160 \text{ miles}$.
- 18. b.** The first bike has 12 teeth on its rear cog and 52 teeth on front chain ring. At 60 rpm, the bike will travel $60 \text{ rpm} \times 52 \text{ front teeth} \div 12 \text{ rear teeth} = 260 \text{ revolutions}$. For the bicycle with 14 teeth on its rear cog to travel 260 revolutions, it must be pedaled at $260 \text{ revolutions} \times 14 \text{ rear teeth} \div 52 \text{ front teeth} = 70 \text{ rpm}$.
- 19. b.** If the container is being filled at 18 gallons per minute (gpm) and evacuated at 14 gpm, then it is filling at an overall rate of $(18 - 14 = 4 \text{ gpm})$. Since the tank can hold 20 gallons, it will fill in $20 \text{ gallons} \div 4 \text{ gallons per minute} = 5 \text{ minutes}$.
- 20. a.** $w_1 \times d_1 = w_2 \times d_2$. $96 \text{ pounds} \times 5 \text{ feet} = w_2 \times 12 \text{ feet}$. Solving for w_2 gives 40 pounds.
- 21. b.** 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, $MA = \frac{l}{h} = 50 \text{ feet} \div 10 \text{ feet} = 5$. The force required to pull a 800-pound block up a ramp is $800 \text{ pounds} \div 5 = 160 \text{ pounds}$.
- 22. d.** Every full turn of the larger gear will result in $18 \text{ teeth} \div 12 \text{ teeth} = 1.5 \text{ rotations}$. In two turns of the larger gear, the smaller will complete 3 rotations.
- 23. a.** The lip of the paint can acts as a fulcrum of a lever when trying to pry off a lid. The long arm of a screwdriver provides a sizeable mechanical advantage.
- 24. a.** $w_1 \times d_1 = w_2 \times d_2$. Stevi is 14 feet away from the pivot point. $70 \text{ pounds} \times 9 \text{ feet} = 14 \text{ feet} \times w_2$. Solving for w_2 gives 45 pounds.
- 25. c.** A pulley system of this type has a mechanical advantage of 2. So, to lift a 150-pound weight will require $150 \text{ pounds} \div 2 = 75 \text{ pounds}$.

Part 9: Assembling Objects

1. a.
2. d.
3. a.
4. c.
5. b.
6. a.
7. c.

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

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