Part 1: General Science

Time: 11 minutes

1. What is adipose tissue composed of?
   a. lipids
   b. amino acids
   c. white blood cells
   d. nucleotides

2. What is needed to balance the reaction
   $N_2 + ?H_2 \leftrightarrow 2NH_3$?
   a. 1
   b. 2
   c. 3
   d. 4

3. Fungi eating the nutrients of a dead plant is an example of
   a. decomposition.
   b. mutualism.
   c. commensalism.
   d. parasitism.

4. Which of the following equations is balanced?
   a. $Ag + Cl_2 \rightarrow 2AgCl$
   b. $2H_2O_2 \rightarrow 2H_2O + O_2$
   c. $KClO_3 \rightarrow KCl + O_2$
   d. $Na + H_2O \rightarrow NaOH + H_2$

5. An internal fan to blow out the excessive heat produced from operating a computer processor is an example of which process?
   a. convection
   b. conduction
   c. active transport
   d. radiation

6. A new solar system in the universe would form at the location of a
   a. supernova.
   b. nebula.
   c. white dwarf.
   d. neutron star.

7. What is the codon responsible for the third amino acid in the sequence represented in the genetic code UACUUCGCU?
   a. CUU
   b. GCU
   c. UUC
   d. UAC

8. For a certain carnation plant, R is the dominant allele for red flowers over r for white flowers. What explains that some plants have pink flowers?
   a. incomplete dominance
   b. mutation
   c. codominance
   d. heterozygous traits

9. What type of chemical equation is
   $2NH_3 \rightarrow N_2 + 3H_2$?
   a. combination reaction
   b. decomposition reaction
   c. single-displacement reaction
   d. double-displacement reaction

10. Which of the following does a cell use to transport amino acids within the cell to the site of protein synthesis?
    a. DNA
    b. rRNA
    c. mRNA
    d. tRNA

11. If the electron configuration of an element is written as $1s^2 2s^2 2px^2 2py^2 2pz^2 3s^1$, the element's atomic
a. number is 11.
b. number is 12.
c. weight is 11.
d. weight is 12.

12. The asteroid belt orbits between which two planets?
a. Mars and Earth
b. Jupiter and Saturn
c. Saturn and Neptune
d. Mars and Jupiter

13. A defect in an organism's alveoli would affect which process organ system?
a. constant blood pressure by the circulatory system
b. air exchange by the respiratory system
c. nutrient absorption by the digestion system
d. secretion of enzymes by the endocrine system

14. When moving down the first column of the periodic table, what can be expected of the elements' radii?
a. The atomic radii increase.
b. The atomic radii decrease.
c. The atomic radii stay the same.
d. The atomic radii increase and decrease.

15. The resulting single cell from an egg fertilized by sperm is called a(n)
a. fetus.
b. zygote.
c. embryo.
d. gamete.

16. If you wanted to change the state of the substance you are observing in an experiment from liquid to solid, what would you do?
a. agitate the substance
b. decrease its pressure
c. increase its temperature
d. increase its pressure

17. A flowering plant relies on fruit for which of the following?
a. competition with other plants
b. energy storage
c. protection of the embryo
d. pollination

18. What factor affects weather most?
a. water content
b. pressure at the Equator
c. wind
d. temperature differences

19. A red-tailed hawk is an example of
a. a primary producer.
b. a primary consumer.
c. a secondary consumer.
d. a migratory consumer.

20. Which of the following is NOT a form of potential energy?
a. a ball at the top of a hill
b. a battery powering a cell phone
c. an apple in a tree
d. a runner about to race

21. Which of the following electron configurations represents a halogen?
a. $1s^2 2s^2 2p^4$
b. $1s^2 2s^2 2p^5$
c. $1s^2 2s^2 2p^6$
d. $1s^2 2s^2 2p^6 3s^1$

22. Which of the following molecules has a double bond?

   a. H_2O

   b. O_3

   c. NH_3

   d. O_2

23. In an organism, the allele **X** is dominant over **x**. If one parent is homozygous dominant (**XX**) and the other is homozygous recessive (**xx**), what percentage of their offspring will express the recessive trait?

   a. 0%

   b. 25%

   c. 50%

   d. 100%

24. The rocky remains of an object from outer space that has collided with Earth are called

   a. meteorites.

   b. meteoroids.

   c. meteors.

   d. asteroids.

25. Which region of the spectrum represents radiation with the highest energy?

   a. radio waves

   b. gamma rays

   c. microwave

   d. X-rays

Part 2: Arithmetic Reasoning

Time: 36 minutes

1. For a science project, Stacy and Tina are measuring the length of two caterpillars. Stacy's caterpillar is 2.345 centimeters long. Tina's caterpillar is 0.0005 centimeter longer. How long is Tina's caterpillar?

   a. 2.0345 centimeters

   b. 2.3455 centimeters

   c. 2.0345 centimeters

   d. 2.845 centimeters

2. An elevator sign reads "Maximum weight 600 pounds." Which of the following may ride the elevator?

   a. three people: one weighing 198 pounds, one weighing 185 pounds, one weighing 200 pounds

   b. one person weighing 142 pounds with a load weighing 500 pounds

   c. one person weighing 165 pounds with a load weighing 503 pounds

   d. three people: one weighing 210 pounds, one weighing 101 pounds, one weighing 298 pounds

3. Laura saves at three times the rate Hazel does. If it takes Laura $1\frac{1}{2}$ years to save $1,000, how many years will it take Hazel to save this amount?

   a. 1

   b. 3.5

   c. 4.5

   d. 6

4. On Wednesday morning, Yoder's Appliance Service had a balance of $2,354.82 in its checking account. If the bookkeeper wrote a total of $867.59 worth of checks that day, how much was left in the checking account?
   a. $1,487.23
   b. $1,487.33
   c. $1,496.23
   d. $1,587.33

5. At the city park, 32% of the trees are oaks. If there are 400 trees in the park, how many trees are NOT oaks?
   a. 128
   b. 272
   c. 278
   d. 312

6. Jake grew 0.6 inch during his senior year in high school. If he was 68.8 inches tall at the beginning of his senior year, how tall was he at the end of the year?
   a. 69.0 inches
   b. 69.2 inches
   c. 69.4 inches
   d. 74.8 inches

7. Phil and Alice went out to dinner and spent a total of $42.09. If they tipped the waiter $6.25 and the tip was included in their total bill, how much did their meal alone cost?
   a. $35.84
   b. $36.84
   c. $36.74
   d. $48.34

Answer question 8 on the basis of the following paragraph.

Basic cable television service, which includes 16 channels, costs $15 a month. The initial labor fee to install the service is $25. A $65 deposit is required but will be refunded within two years if the customer's bills are paid in full. Other cable services may be added to the basic service: The movie channels service is $9.40 a month; the news channels are $7.50 a month; the arts channels are $5.00 a month; and the sports channels are $4.80 a month.

8. A customer's first bill after having cable television installed totaled $110. This customer chose basic cable and one additional cable service. Which additional service was chosen?
   a. the news channels
   b. the movie channels
   c. the arts channels
   d. the sports channels

9. A loaf of bread has 35 slices. Ann eats eight slices, Betty eats six slices, Carl eats five slices, and Derrick eats nine slices. What fraction of the loaf is left?
   a. $\frac{2}{11}$
   b. $\frac{1}{9}$
   c. $\frac{2}{7}$
   d. $\frac{1}{5}$

10. The butcher at Al's Meat Market divided ground beef into eight packages. If each package weighs 0.75 pound and he has 0.04 pound of ground beef left over, how many pounds of ground beef did he start with?
   a. 5.064 pounds
   b. 5.64 pounds
   c. 6.04 pounds
   d. 6.4 pounds

11. While on a three-day vacation, the Wilsons spent the following amounts on motel rooms: $52.50, $47.99, and $49.32.What is the total amount they spent?
a. $139.81
b. $148.81
c. $148.83
d. $149.81

12. Dan rented two movies to watch last night. The first was 1 hour 40 minutes long, the second 1 hour 50 minutes long. How much time did it take for Dan to watch the two videos?
a. 4.5 hours
b. 3.5 hours
c. 2.5 hours
d. 1.5 hours

13. The Benton High School girls' relay team ran the mile in 6.32 minutes in April. By May, they were able to run the same race in 6.099 minutes. By how much time had their time improved?
a. 0.221 minute
b. 0.339 minute
c. 0.467 minute
d. 0.67 minute

14. If one pound of chicken costs $2.79 a pound, how much does 0.89 pound of chicken cost, rounded to the nearest cent?
a. $2.40
b. $2.48
c. $2.68
d. $4.72

15. In order to pass a certain exam, candidates must answer 70% of the test questions correctly. If there are 70 questions on the exam, how many questions must be answered correctly in order to pass?
a. 49
b. 52
c. 56
d. 60

16. Rashaard went fishing six days in the month of June. He caught eleven, four, zero, five, four, and six fish respectively. On the days that Rashaard fished, what was his average catch?
a. 4
b. 5
c. 6
d. 7

17. Ingrid has two pieces of balsa wood. Piece A is 0.724 centimeter thick. Piece B is 0.0076 centimeter thicker than Piece A. How thick is Piece B?
a. 0.7164 centimeter
b. 0.7316 centimeter
c. 0.8 centimeter
d. 0.08 centimeter

18. How many different meals can be ordered from a restaurant if there are three choices of soup, five choices of entrées, and two choices of dessert if a meal consists of a soup, entrée, and dessert?
a. 10
b. 15
c. 30
d. 60

19. If Nanette cuts a length of ribbon that is 13.5 inches long into four equal pieces, how long will each piece be?
- **a.** 3.3075 inches
- **b.** 3.375 inches
- **c.** 3.385 inches
- **d.** 3.3805 inches

20. Marty and Phyllis arrive late for a movie and miss 10% of it. The movie is 90 minutes long. How many minutes did they miss?
- **a.** 10 minutes
- **b.** 9 minutes
- **c.** 8 minutes
- **d.** 7 minutes

21. During an eight-hour workday, Bob spends two hours on the phone. What fraction of the day does he spend on the phone?
- **a.** $\frac{1}{5}$
- **b.** $\frac{1}{3}$
- **c.** $\frac{1}{4}$
- **d.** $\frac{1}{8}$

22. To reach his tree house, Raymond has to climb $9\frac{1}{3}$ feet up a rope ladder, then $8\frac{5}{6}$ feet up the tree trunk. How far does Raymond have to climb altogether?
- **a.** $17\frac{7}{12}$ feet
- **b.** $17\frac{1}{6}$ feet
- **c.** $18\frac{1}{6}$ feet
- **d.** $18\frac{1}{2}$ feet

23. About how many quarts of water will a 3.25-liter container hold? (one liter = 1.06 quarts)
- **a.** 3.066 quarts
- **b.** 3.045 quarts
- **c.** 3.445 quarts
- **d.** 5.2 quarts

24. How many $5\frac{1}{4}$-ounce glasses can be completely filled from a $33\frac{1}{2}$-ounce container of juice?
- **a.** 4
- **b.** 5
- **c.** 6
- **d.** 7

25. Lucille spent 12% of her weekly earnings on DVDs and deposited the rest into her savings account. If she spent $42 on DVDs, how much did she deposit into her savings account?
- **a.** $42
- **b.** $308
- **c.** $318
- **d.** $350

26. Millie is a night security guard at the art museum. Each night, she is required to walk through each gallery once. The museum contains 52 galleries. This night, Millie has walked through 16 galleries. What fraction of the total galleries has she already visited?
- **a.** $\frac{4}{13}$
- **b.** $\frac{1}{16}$
- **c.** $\frac{5}{11}$
- **d.** $\frac{3}{14}$

27. At age six, Zack weighed 40.6 pounds. By age seven, Zack weighed 46.1 pounds. How much weight did he gain in that one year?
- **a.** 4.5 pounds
- **b.** 5.5 pounds
- **c.** 5.7 pounds
- **d.** 6.5 pounds

28. Michael has a $20 bill and a $5 bill in his wallet and $1.29 in change in his pocket. If he buys a half gallon of ice cream that costs $4.89, how much money will he have left?
- **a.** $22.48
- **b.** $22.30
- **c.** $21.48
- **d.** $21.40

29. Land consisting of a quarter section is sold for $1,850 per acre (one quarter section = 160 acres). The total sale price is
   a. $296,000.
   b. $592,000.
   c. $1,184,000.
   d. $1,850,000.

30. Emilio is 1 year 7 months old, and Brooke is 2 years 8 months old. How much older is Brooke than Emilio?
   a. 1 year 1 month
   b. 2 years
   c. 1 month
   d. 1 year 2 months

Part 3: Word Knowledge

Time: 11 minutes

1. *Incredulous* most nearly means
   a. faithful.
   b. trustworthy.
   c. skeptical.
   d. incredible.

2. *Disabuse* most nearly means
   a. heal.
   b. correct.
   c. harm.
   d. praise.

3. *Laconic* most nearly means
   a. lazy.
   b. concise.
   c. fleeting.
   d. wordy.

4. *Spurious* most nearly means
   a. genuine.
   b. antique.
   c. inauthentic.
   d. sharp.

5. *Nadir* most nearly means
   a. honor.
   b. median.
   c. peak.
   d. bottom.

6. *Allay* most nearly means
   a. soothe.
   b. vary.
   c. arrange.
   d. postpone.

7. *Disingenuous* most nearly means
   a. reliable.
   b. insincere.
   c. smart.
   d. honest.

8. *Adversely* most nearly means
   a. instantly.
   b. mildly.
   c. regularly.
   d. negatively.

9. *Courtesy* most nearly means
   a. civility.
   b. congruity.
   c. conviviality.
   d. rudeness.

10. *Frail* most nearly means
   a. vivid.
   b. delicate.
   c. robust.
   d. adaptable.

11. *Recuperate* most nearly means
 a. mend.
 b. endorse.
 c. persist.
 d. worsen.

12. *Meager* most nearly means
 a. majestic.
 b. scarce.
 c. tranquil.
 d. adequate.

13. *Apathetic* most nearly means
 a. pitiable.
 b. indifferent.
 c. suspicious.
 d. evasive.

14. *Surreptitious* most nearly means
 a. expressive.
 b. secretive.
 c. emotional.
 d. gullible.

15. *Droll* most nearly means
 a. boring.
 b. slobbering.
 c. amusing.
 d. gullible.

16. *Commendable* most nearly means
 a. admirable.
 b. accountable.
 c. irresponsible.
 d. noticeable.

17. *Disperse* most nearly means
 a. gather.
 b. agree.
 c. scatter.
 d. vary.

18. *Domain* most nearly means
 a. entrance.
 b. rebellion.
 c. formation.
 d. territory.

19. *Ludicrous* most nearly means
 a. ridiculous.
 b. lecherous.
 c. loud.
 d. reasonable.

20. *Augment* most nearly means
 a. repeal.
 b. evaluate.
 c. increase.
 d. criticize.

21. *Archaic* most nearly means
 a. tangible.
 b. modern.
 c. ancient.
 d. haunted.

22. *Vindictive* most nearly means
 a. outrageous.
 b. insulting.
 c. spiteful.
 d. offensive.

23. *Orient* most nearly means
 a. confuse.
 b. arouse.
 c. deter.
 d. adjust.

24. *Expendable* most nearly means
 a. flexible.
 b. replaceable.
 c. expensive.
 d. extraneous.

25. *Revolutionize* most nearly means
  a. cancel.
  b. preserve.
  c. maintain.
  d. transform.

26. The dry modeling clay was no longer *malleable* after the young boys left it uncovered overnight.
  a. useful
  b. wet
  c. hardened
  d. shapeable

27. The tutoring Sheila received had a *salutary* effect on her grade point average.
  a. negligible
  b. welcoming
  c. beneficial
  d. negative

28. The *florid* ceiling of the palace contained a very colorful and detailed painting that was surrounded by gold leaf moldings.
  a. high
  b. ornate
  c. flat
  d. bare

29. Carl realized he had hit the jackpot when he opened his grandfather's safe deposit box and found a 1921 baseball card in *pristine* condition.
  a. worn
  b. untouched
  c. valuable
  d. fair

30. Running out of gas in the middle of the desert in August was an *abysmal* turn of events.
  a. terrible
  b. fortunate
  c. unexpected
  d. preventable

31. The CIA agent put herself in a very *precarious* situation by sneaking into the embassy.
  a. haphazard
  b. embarrassing
  c. dangerous
  d. comfortable

32. The minor earthquake left everything in my house *askew*.
  a. destroyed
  b. crooked
  c. untouched
  d. dirty

33. Matthew's sneakers were *sodden* after jumping in every puddle on the block.
  a. soaked
  b. dirty
  c. ruined
  d. cleaned

34. As a novice mountain climber, Maria wasn't prepared for the *precipitous* face of El Capitan.
  a. dangerous
  b. slippery
  c. steep
  d. level

35. The museum has a broad array of archeological displays from contemporary society to *primeval* artifacts from the age of the caveman.
  a. cursed
  b. ancient
  c. wrecked
  d. mysterious

Part 4:
Paragraph Comprehension

Time: 13 minutes

The card game known as poker is an American tradition and has become immensely popular in recent years around the world. The modern version of the game was largely developed during the 1800s when the United States was expanding into the west, and it was played by pioneers and frontiersmen seeking some entertainment and human fellowship to relieve the hard *toil* of their daily lives.

Poker has also influenced our daily speech in many ways. Elements of the game have found their way into common phrases that form colorful ways of describing things. For example, people frequently speak of "calling a person's bluff," which refers to the act of forcing someone to prove that he's telling the truth—and this comes directly from the art of bluffing that forms the foundation of modern poker. A person will "up the ante" if he increases the amount of risk in an undertaking, similar to increasing the amount of one's bet. Other examples include *ace in the hole*, *ace up the sleeve*, *cash in*, and *poker face*. It's just a simple game, but it's had a big influence in American culture.

1. Which of the following would be the best title for this passage?
   a. Poker in Modern Times
   b. A History of Betting
   c. The Dangers of Gambling Addiction
   d. The Rules of Poker

2. The author of this passage most likely would agree that
   a. poker is an evil game.
   b. gambling is dangerous.
   c. poker has influenced modern culture.
   d. bluffing requires a straight face.

3. As used in the passage, *toil* most nearly means
   a. dirt.
   b. hard work.
   c. pioneering.
   d. something shiny.

4. The phrase *poker face* most likely means
   a. to look ugly.
   b. to be weary from playing cards too long.
   c. to up the ante.
   d. to hide one's emotions behind a blank expression.

In criminal cases, the availability of readable fingerprints is often critical in establishing evidence of a major crime. It is necessary, therefore, to follow proper procedures when taking fingerprints. In major cases, prints should be obtained from all persons who may have touched areas associated with a crime scene in order to *diminish* the number of suspects.

5. The main idea of the paragraph is that
   a. because fingerprints are so important in many cases, it is important to follow the correct course in taking them.
   b. all fingerprints found at a crime scene should be taken and thoroughly investigated.
   c. if the incorrect procedure is followed in gathering fingerprints, the ones taken may be useless.
   d. the first step in investigating fingerprints is to eliminate those of non-suspects.

6. The paragraph best supports the statement that
   a. no crimes can be solved without readable fingerprints.
   b. all persons who have touched an area in a crime scene are suspects.
   c. all fingerprints found at a crime scene are used in court as evidence.
   d. all persons who have touched a crime scene area should be fingerprinted.

7. As used in the passage, *diminish* most nearly means
   a. to make larger.
   b. to make smaller.
   c. a guilty person.
   d. an innocent person.

Tobacco is used in a variety of ways, including old-fashioned snuff, chewing tobacco, and tobacco for smoking. It is actually dried and crushed plant leaves that are grown widely throughout the world, but what distinguishes one tobacco from another is the way in which it is *cured*. The curing process determines what the tobacco will taste like, and that largely determines how it will be used.

   Tobacco used in cigars, for example, is air cured, hung in odd-looking barns that have wide spaces between the exterior wall boards, which allows air to ventilate through. This process takes four to eight weeks, but it produces a light, sweet-tasting tobacco. Chewing tobacco is cured using *smoldering* fires that fill a barn with smoke. This process takes less time but also removes the natural sugars, making a tobacco that is less sweet. Tobacco used in cigarettes is cured by heat, but the fires are burned outside the barn rather than inside, and the hot air is circulated through the interior of the structure. This process is far more complicated, but it is fast and allows the tobacco to retain its natural sweetness.

8. Which of the following describes the author's attitude toward smoking in this passage?
   a. Smoking is a nasty habit and should be outlawed.
   b. Smoking is a harmless pastime.
   c. The author believes that people should be forbidden from smoking in public areas, but free to smoke at home.
   d. The author does not address the moral implications of smoking.

9. As used in the passage, *cured* most nearly means
   a. made well.
   b. medicated.
   c. mentholated.
   d. dried.

10. According to the passage, which type of tobacco is air cured?
   a. pipe
   b. cigar
   c. chewing
   d. cigarette

11. As used in the passage, *smoldering* most nearly means
   a. angry.
   b. low-burning.
   c. smelly.
   d. moldy.

In the summer, the Northern Hemisphere is slanted toward the Sun, making the days longer and warmer than in winter. The first day of summer, June 21, is called summer solstice and is also the longest day of the year. However, June 21 marks the beginning of winter in the Southern Hemisphere, when that hemisphere is tilted away from the Sun.

12. According to the passage, when it is summer in the Northern Hemisphere, it is _____ in the Southern Hemisphere.
   a. spring
   b. summer
   c. autumn
   d. winter

13. It can be inferred from the passage that, in the Southern Hemisphere, June 21 is the
   a. autumnal equinox.
   b. winter solstice.
   c. vernal equinox.
   d. summer solstice.

The competitive civil service system is designed to give candidates fair and equal treatment and to ensure that federal applicants are hired based on objective criteria. Hiring has to be based solely on a candidate's knowledge, skills, and abilities (which you'll sometimes see abbreviated as *ksa*), and not on external factors such as race, religion, sex, and so on. Whereas employers in the private sector can hire employees for subjective reasons, federal employers must be able to justify their decision with objective evidence that the candidate is qualified.

14. The paragraph best supports the statement that
   a. hiring in the private sector is inherently unfair.
   b. *ksa* is not as important as test scores to federal employers.
   c. federal hiring practices are simpler than those employed by the private sector.
   d. the civil service strives to hire on the basis of a candidate's abilities.

15. The federal government's practice of hiring on the basis of *ksa* frequently results in the hiring of employees
   a. based on race, religion, sex, and so forth.
   b. who are unqualified for the job.
   c. who are qualified for the job.
   d. on the basis of subjective judgment.

Part 5: Mathematics Knowledge

Time: 24 minutes

1. Which of these equations is incorrect?
   a. $\sqrt{16} + \sqrt{3} = \sqrt{16+3}$
   b. $\sqrt{6} + \sqrt{12} = \sqrt{6+12}$
   c. Neither is incorrect.
   d. Both are incorrect.

2. Sixteen less than six times a number is 20. What is the number?
   a. 12
   b. 10
   c. 8
   d. 6

3. The most ergonomically correct angle between the keyboard and the screen of a laptop computer is 100°. This is called
   a. an acute angle.
   b. a complimentary angle.
   c. an obtuse angle.
   d. a right angle.

4. Which of these angle measures form a right triangle?
   a. 40°, 40°, 100°
   b. 20°, 30°, 130°
   c. 40°, 40°, 40°
   d. 40°, 50°, 90°

5. Evaluate the following expression if $a = 3$, $b = 4$, and $c = -2$: $(ab - ac) \div abc$.
   a. $-\frac{7}{8}$
   b. $-\frac{3}{4}$
   c. $-\frac{1}{4}$
   d. $\frac{1}{4}$

6. Which value of a will make this number sentence false? $a \leq 5$
   a. 0
   b. −3
   c. 5
   d. 6

7. Change this mixed number to an improper fraction: $5\frac{1}{2}$.
   a. $\frac{11}{2}$
   b. $\frac{5}{1}$
   c. $\frac{7}{2}$
   d. $\frac{5}{2}$

8. Which of the following choices is equivalent to 2^5?

   a. 7

   b. 10

   c. 16

   d. 32

9. Which of the following is equivalent to $2y^2$?

   a. $2(y + y)$

   b. $2y(y)$

   c. $y^2 + 2$

   d. $y + y + y + y$

10. If $\frac{2}{x} + \frac{x}{6} = 4$, what is x?

   a. $\frac{1}{24}$

   b. $\frac{1}{6}$

   c. 3

   d. 6

11. What is the value of $16^{1/2}$?

   a. 2

   b. 4

   c. 8

   d. 32

12. What is the smallest prime number?

   a. 0

   b. 1

   c. 2

   d. 3

13. If $5a + 50 = 150$, then a is

   a. 10

   b. 20

   c. 30

   d. 40

14. If the following figure is a regular decagon with a center at Q, what is the measure of the indicated angle?

   a. 45°

   b. 80°

   c. 90°
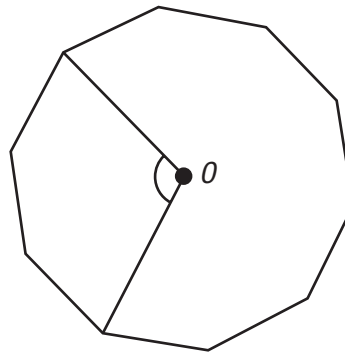
   d. 108°

15. Which of the following choices is divisible by both 7 and 8?

   a. 42

   b. 78

   c. 112

   d. 128

16. Which of the following is a simplification of $(x^2 + 4x + 4) \div (x + 2)$?

   a. $x - 2$

   b. $x + 4$

   c. $x^2 + 3x + 2$

   d. $x + 2$

17. If $\frac{x}{72} = 2$, then x is

   a. 9

   b. 36

   c. 144

   d. 72

18. The area of a rectangular table is 72 square inches. The longer sides are 12 inches long. What is the width?

a. 5 inches
b. 6 inches
c. 7 inches
d. 8 inches

19. A triangle has sides that are consecutive even integers. The perimeter of the triangle is 24 inches. What is the length of the shortest side?

a. 10 inches
b. 8 inches
c. 6 inches
d. 4 inches

20. The tens digit is four times the ones digit in a certain number. If the sum of the digits is 10, what is the number?

a. 93
b. 82
c. 41
d. 28

21. $\frac{x}{4} + \frac{3x}{4} =$

a. $\frac{1}{2}x$
b. $\frac{x^3}{4}$
c. 1
d. x

22. Two angles are supplementary. One measures 84°. What does its supplement measure?

a. 90°
b. 276°
c. 6°
d. 96°

23. What lines must be parallel in the following diagram?
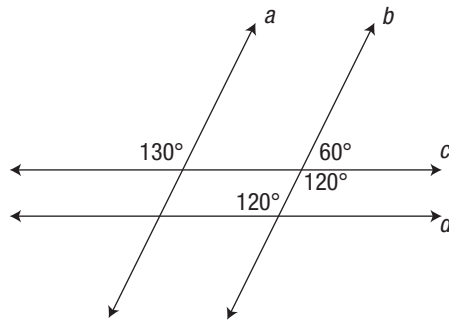
a. a and b
b. a and d
c. b and c
d. c and d

24. What is the value of 56,515 ÷ 4, rounded to the nearest whole number?

a. 10,000
b. 14,000
c. 14,128
d. 14,129

25. Five oranges, when removed from a basket containing three more than seven times as many oranges, leaves how many in the basket?

a. 21
b. 28
c. 33
d. 38

Part 6: Electronics Information

Time: 9 minutes

1. A circuit breadboard is used

a. to easily build and break down circuits.
b. to solder parts together.
c. to prepare all the parts of a circuit.
d. to build permanent circuits.

2. Why is flux used with electronic soldering?
   a. to prevent the formation of oxides
   b. to facilitate the flow of solder onto an electronic connection
   c. to enhance the fusing of the solder as it cools
   d. none of the above

3. A cold solder joint is
   a. brittle and weaker than a hot solder joint.
   b. not good at conducting electricity.
   c. both **a** and **b**
   d. neither **a** nor **b**

4. "Wire wrapping" is
   a. used only in large electronic arrays.
   b. a means of identifying electronic parts.
   c. a means of assembling electronics.
   d. used as an emergency repair.

5. What does the following schematic symbol represent?

   a. a speaker
   b. a thermostat
   c. a piezoelectric buzzer
   d. a microphone

6. What does a multimeter measure?
   a. voltage
   b. current
   c. resistance
   d. all the above

7. What does the abbreviation "mA" mean in relation to amperes?
   a. microamps
   b. multiamps
   c. milliamps
   d. none of the above

8. What does the following schematic symbol represent?
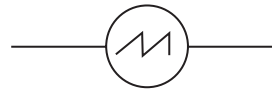
   a. a waveguide
   b. an open circuit
   c. a multimeter
   d. an oscilloscope

9. What does the following schematic symbol represent?
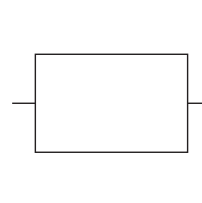
   a. an unspecified output
   b. a shielded jack
   c. a jack and plug
   d. an unspecified component

10. An oscilloscope is a useful tool for
   a. displaying how signal voltage varies over time.
   b. calculating ohms based on voltage detected.
   c. measuring amperage.
   d. testing the current to confirm AC or DC.

11. The two most important features of an oscilloscope are
   a. resolution and digital storage.
   b. delayed sweep and digital storage.
   c. bandwidth and resolution.
   d. bandwidth and delayed sweep.

12. What function does the inductor perform in the circuit diagram?
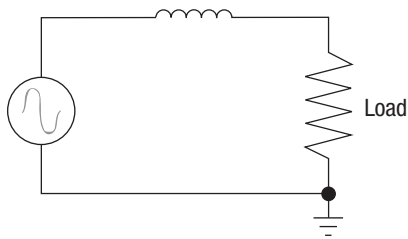
a. band stop filter
b. band pass filter
c. low pass filter
d. high pass filter

13. What is the biggest advantage of fiber optic data lines over coaxial or conventional data transmission lines?
a. Fiber optic lines carry more data.
b. Fiber optic lines are easier to configure and use.
c. Fiber optic lines cost less.
d. Fiber optic lines are more robust than conventional lines.

14. When building a simple series circuit, which of the following should always be connected last?
a. the capacitor
b. the fixed resistor
c. the potentiometer
d. the power

15. A potentiometer is commonly used to
a. control power input to a transformer.
b. provide power to lamps.
c. control volume in audio equipment.
d. provide power to televisions.

16. A difference between high definition television (HDTV) and standard definition television (SDTV) is
a. SDTV is in black and white, whereas HDTV is in color.
b. HDTV raster has more lines than SDTV raster.
c. SDTV is transmitted by cable whereas HDTV is transmitted by satellite.
d. HDTV requires fiber optic cable whereas SDTV does not.

17. In electronics, CRT stands for
a. cathode ray tube.
b. capacitor reduction tool.
c. current refinement tool.
d. coulomb relay trend.

18. What does the following schematic symbol represent?

a. an antenna
b. a semiconductor
c. a chassis ground
d. an earth ground

19. An example of an output transducer would be a(n)
a. lamp.
b. loudspeaker.
c. light-emitting diode (LED).
d. all the above

20. What type of electronic memory can be accessed but not changed?
a. diode memory
b. bipolar memory
c. read only memory (ROM)
d. random access memory (RAM)

Part 7:
Auto and Shop Information

Time: 11 minutes

1. A higher viscosity rating for a given oil signifies that
   a. the oil is thicker.
   b. the oil is thinner.
   c. the oil is better in winter.
   d. the oil will last longer in the engine environment.

2. Which of the following items is part of the braking system in an automobile?
   a. hydraulic fluid
   b. electrolyte
   c. antifreeze
   d. high-viscosity oil

3. Which of the following items is part of the air-conditioning system in an automobile?
   a. the condenser
   b. the compressor
   c. the evaporator
   d. all the above

4. Which of the following items is part of the electrical system in an automobile?
   a. fuses
   b. a distributor cap
   c. an alternator
   d. all the above

5. Which of the following items is part of the engine start system in an automobile?
   a. the ignition coil
   b. the oil pump
   c. the catalytic converter
   d. the thermometer

6. Where does combustion occur in an internal combustion engine?
   a. in the oil pan
   b. in the fuel bladders
   c. in the cylinders
   d. in the carburetor

7. The four cycles of an internal compression engine in proper order are
   a. intake, compression, ignition, exhaust.
   b. compression, intake, power, exhaust.
   c. intake, power, compression, exhaust.
   d. intake, compression, power, exhaust.

8. In which of the internal combustion engine cycles does the spark plug fire?
   a. the intake cycle
   b. the compression cycle
   c. the power cycle
   d. the exhaust cycle

9. What must happen for the exhaust cycle to complete?
   a. The power cycle is initiated.
   b. Both the exhaust valve and the intake valves are closed.
   c. The exhaust valve opens and the intake valve is open.
   d. The exhaust valve opens and the intake valve is closed.

10. In a conventional camshaft engine, the camshaft pushes on which of the following?
    a. the rocker arm
    b. the solenoid
    c. the camshaft lobe
    d. none of the above

11. Blue smoke in an automobile exhaust indicates
    a. the water pump is failing.
    b. wear of the rings and/or cylinders.
    c. the radiator needs attention.
    d. the catalytic converter needs replacing.

12. An internal combustion engine needs what three basic items in order to operate properly?
a. fuel, oxygen, and oil
b. fire, fuel, and transmission fluid
c. fire, fuel, and oxygen
d. coolant, fuel, and oxygen

13. Approximately what percent of the energy in gasoline is converted to energy to drive the car?
a. 10%
b. 15%
c. 30%
d. 50%

14. Which of the following tools is an Allen wrench?

a.
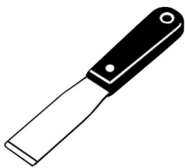
b.

c.

d.
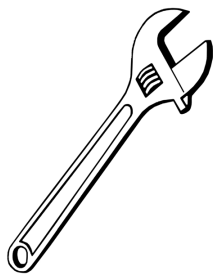
15. Which of the following would you use with a slotted head screw driver?

a.

b.

c.

d.

16. Which hand tool listed here is used to tighten a nut and bolt?
a. a crescent wrench
b. a reamer
c. calipers
d. pipe clamps

17. What gauge is used to determine the number of threads per inch on a standard screw?
a. a depth gauge
b. a wire gauge
c. a thickness gauge
d. a thread gauge

18. Which of the following items is used to measure angles?
a. a protractor
b. a level
c. a tachometer
d. a gear

19. Which of the following woodworking objects would most likely be created with a lathe?
a. a bench slat
b. a baseball bat
c. a bookshelf
d. a chair seat

20. The tool shown here should only be used to
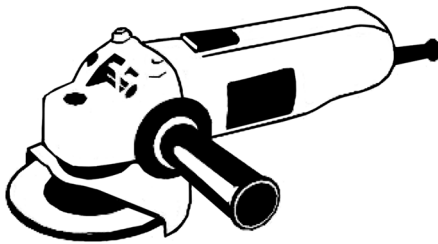
a. cut copper pipe.
b. put a finished surface on lumber.
c. cut, grind, or polish metal.
d. cut rabbet joints.

21. The part of a drill bit that is grabbed and held by the drill chuck is called the
a. root.
b. trunk.
c. stem.
d. shank.

22. One of the drawbacks in using steel with outdoor construction is
a. the need to paint and treat the steel.
b. its inability to flex in cold weather.
c. its rigidity during warm weather.
d. the need to use rivets to join pieces together.

23. What is the tool shown here?
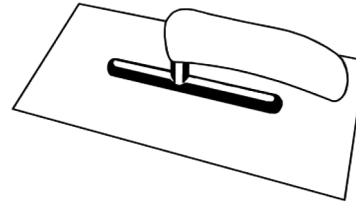
a. a level
b. a trowel
c. a bench plane
d. a mortar brush

24. What is the tool shown here?

a. a pipe wrench
b. a pipe threader
c. an Allen wrench
d. a pipe cutter

25. The tool shown here would be used to

a. apply adhesive by melting glue sticks.
b. drive small brads or nails into wood.
c. melt solder to join pieces of material.
d. attach pop rivets to join pieces of material.

Part 8:
Mechanical Comprehension

Time: 19 minutes
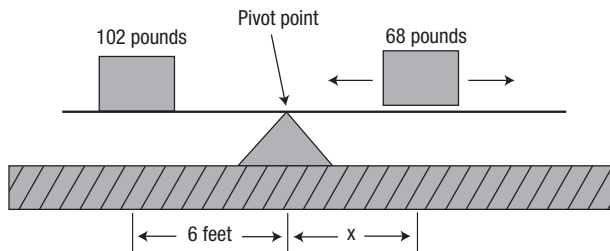
1. In the diagram, Vartan wants to balance two blocks on either side of a lever. One block weighs 102 pounds and the other weighs 68 pounds. If the 102-pound block is 6 feet to the left of the pivot point, how far to the right of the pivot point should the 68-pound block be placed?
- **a.** 12 feet
- **b.** 6 feet
- **c.** 4 feet
- **d.** 9 feet

2. Two ramps can be used to raise a heavy barrel up to a platform. Neglecting friction, which ramp requires less force to raise the barrel?
- **a.** ramp A
- **b.** ramp B
- **c.** It requires the same amount of work.
- **d.** It is impossible to determine.

3. If a pulley is attached to the top of a flagpole, what is the mechanical advantage of using the pulley to raise a flag up the pole?
- **a.** 1
- **b.** 2
- **c.** 3
- **d.** 4
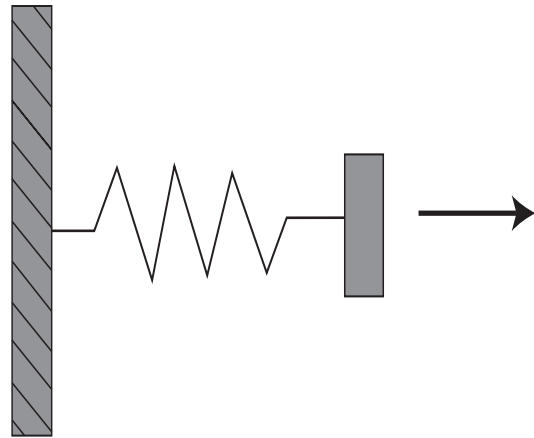
4. A force of 4 pounds is required to move a spring 6 inches. How far will the spring stretch under 6 pounds of force?
- **a.** 6 inches
- **b.** 9 inches
- **c.** 12 inches
- **d.** 15 inches
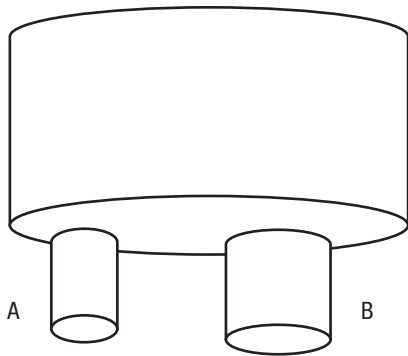
5. Two pipes are used to drain liquid from a 100-gallon barrel. Pipe A is 2 inches in diameter and pipe B is 4 inches in diameter. How much faster does liquid leave the barrel through pipe B compared to pipe A?
   a. Liquid leaves both pipes at the same rate.
   b. Liquid flows out of pipe B twice as fast.
   c. Liquid flows out of pipe B four times as fast.
   d. Liquid flows out of pipe B eight times as fast.
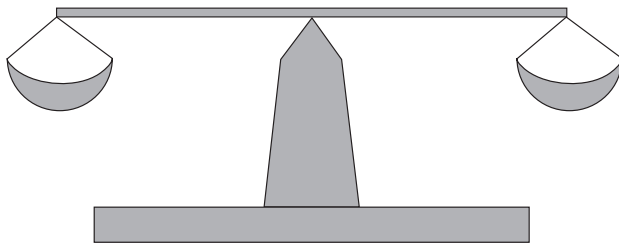
6. The type of scale shown in the diagram is based on what simple machine?
   a. the lever
   b. the pulley
   c. the inclined plane
   d. the screw

7. Steel battleships are able to float because
   a. steel is less dense than water.
   b. steel is denser than water.
   c. the ship displaces its weight in water.
   d. the ship displaces less than its weight in water.
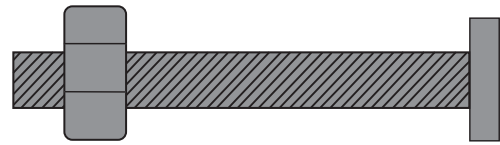
8. If 9 full turns are required to move the nut 0.75 inches, how many threads per inch does the screw have?
   a. 10
   b. 12
   c. 14
   d. 16
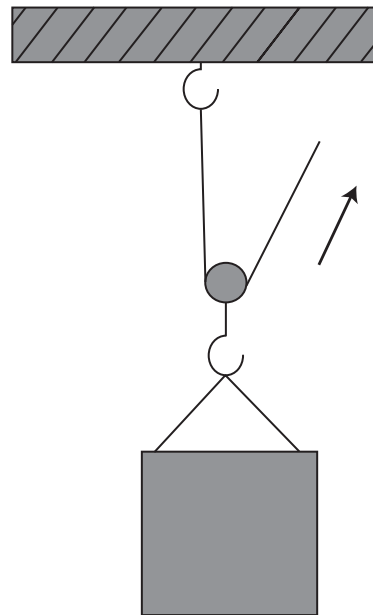
9. What is the mechanical advantage of the pulley system shown here?
   a. 1
   b. 2
   c. 3
   d. 4

10. A cold beverage will stay cold longest in which of the following containers?
   a. a glass bottle
   b. an aluminum can
   c. a plastic bottle
   d. a paper cup

14. A single-speed bicycle has a front chain ring with 54 teeth. The back gear has 12 teeth. If the bicycle is pedaled at 90 rpm, how fast does the rear wheel rotate?

- **a.** 90 rpm
- **b.** 180 rpm
- **c.** 405 rpm
- **d.** 500 rpm

15. A balloon is filled with helium. It is then taken to a special room where the air pressure is decreased. What will happen to the balloon?

- **a.** Its size will increase.
- **b.** Its size will decrease.
- **c.** Its size will stay the same.
- **d.** It will begin to sink.

11. If gear 3 turns counterclockwise, which other gear(s), if any, will turn clockwise?

- **a.** 1 and 5
- **b.** 2 and 4
- **c.** All will turn clockwise.
- **d.** None will turn clockwise.
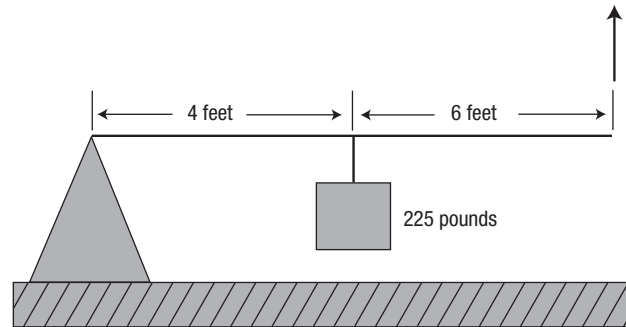
16. In the diagram, Daniel wants to lift a 225-pound block using a lever. If the block is 4 feet from the pivot point and Daniel is 6 feet beyond that, how much force must he apply to lift the block?

- **a.** 100 pounds
- **b.** 24 pounds
- **c.** 90 pounds
- **d.** 225 pounds

12. Pulley B has four times the circumference of pulley A. If pulley A rotates at 60 revolutions per minute (rpm), how fast must pulley B rotate?

- **a.** 15 rpm
- **b.** 30 rpm
- **c.** 60 rpm
- **d.** 240 rpm

13. An object is most likely to slide the farthest on which surface?

- **a.** ice
- **b.** wood
- **c.** dirt
- **d.** rubber
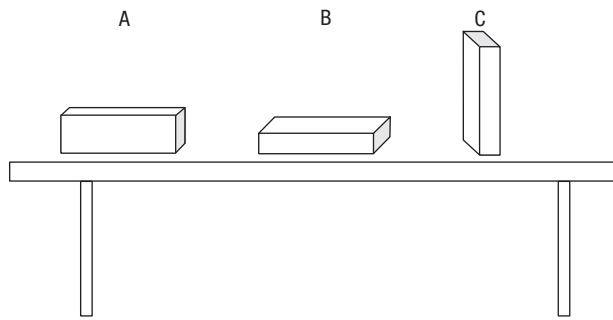
17. Three identical objects are placed on a table in different orientations. Which orientation is most stable?
a. orientation A
b. orientation B
c. orientation C
d. A and C are equally the most stable.

18. A rock is shown to have a density of 10 g/cm^3. It is then cut precisely in half. What is the density of the two pieces?
a. 5 g/cm^3
b. 8 g/cm^3
c. 10 g/cm^3
d. 20 g/cm^3
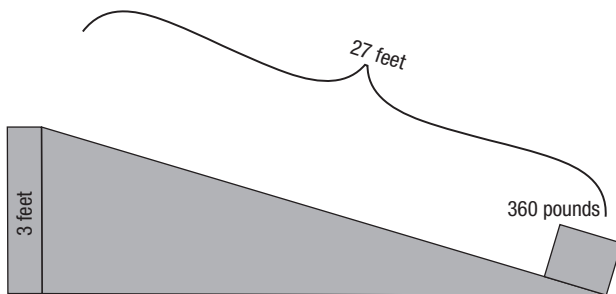
19. A 360-pound block is being pulled up an incline by a pulley. The incline is 27 feet long and rises 3 feet. Neglecting friction, how much force is necessary to move the block up the incline?
a. 81 pounds
b. 360 pounds
c. 387 pounds
d. 40 pounds
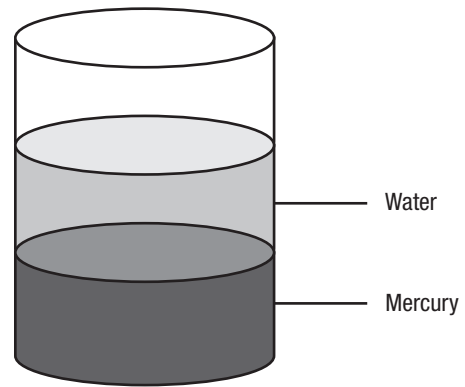
20. A lead plug is dropped into a beaker containing mercury and water. Mercury is a liquid with a density of 8 g/cm^3 and water has a density of 1 g/cm^3. If the plug has a density of 10 g/cm^3, where will it settle in the beaker?
a. at the bottom of the beaker
b. in the middle of the mercury layer
c. in between the mercury and water layers
d. on top of the water layer
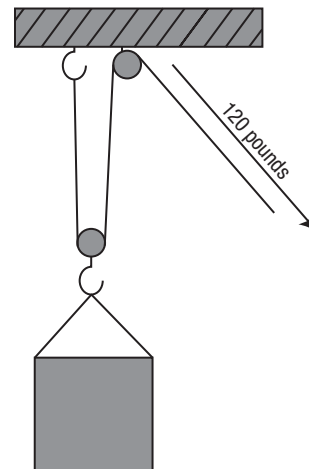
21. Keiko is strong enough to pull a rope with 120 pounds of force. Using the pulley system shown here, what is the maximum weight she can lift?
a. 480 pounds
b. 360 pounds
c. 240 pounds
d. 120 pounds

450 pounds

3 feet — 9 feet
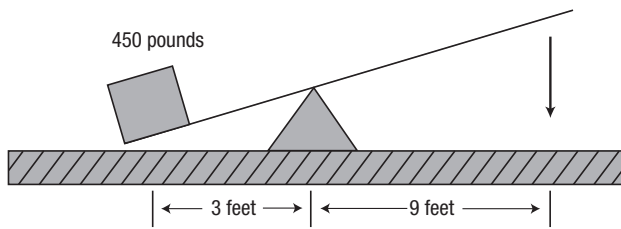
22. In the diagram, Robert wants to lift a 450-pound block using a lever. If the block is 3 feet from the pivot point and Robert is 9 feet from the pivot point, how much force must he apply to lift the block?

a. 450 pounds
b. 27 pounds
c. 150 pounds
d. 462 pounds

23. Two men are leave checkpoint 1 at the same time in the same direction. One travels at 25 mph and the other at 15 mph. How far apart are they after one hour?

a. 5 miles
b. 10 miles
c. 25 miles
d. 40 miles

16 feet

70 pounds

280 pounds

x feet
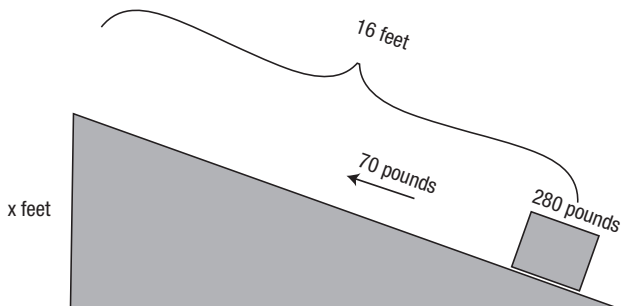
24. A 280-pound block is being pulled up an incline by a pulley. The incline is 16 feet long. Neglecting friction, if 70 pounds of force is necessary to move the block up the incline, how tall is the incline?

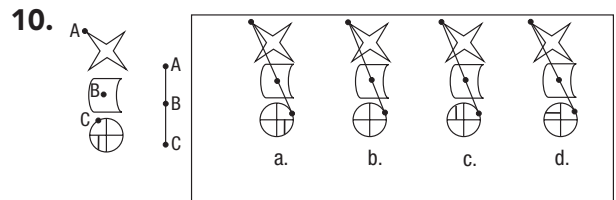**a.** 4 feet
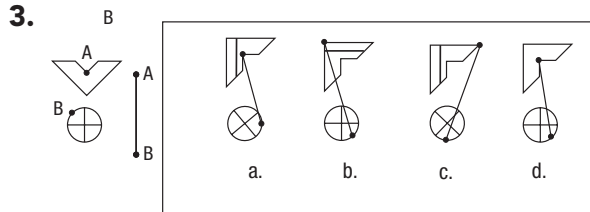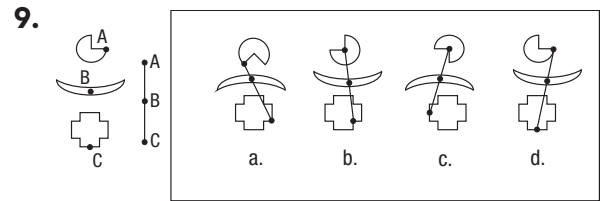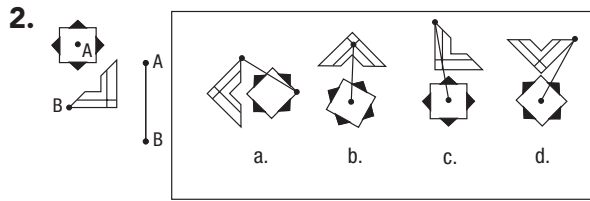**b.** 8 feet
c. 16 feet
d. 2.5 feet
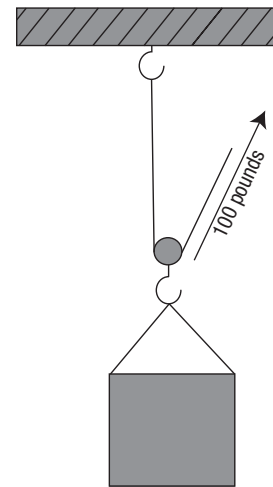
100 pounds

25. Maria is strong enough pull a rope with 100 pounds of force. Using the pulley system shown here, what is the maximum weight she can lift?

a. 50 pounds
b. 100 pounds
c. 150 pounds
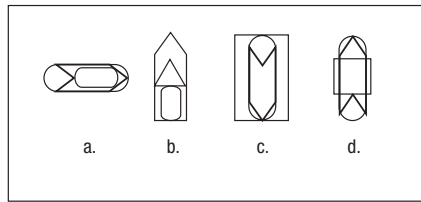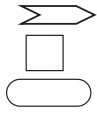**d.** 200 pounds

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.

a. b. c. d.

2.

a. b. c. d.

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.
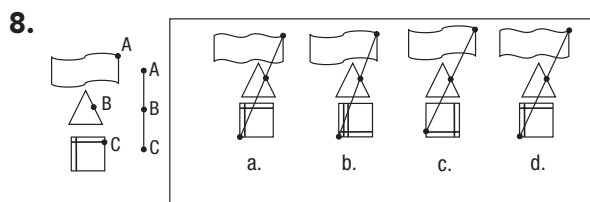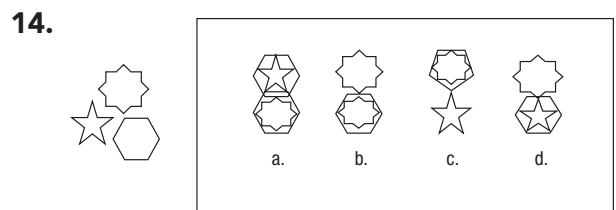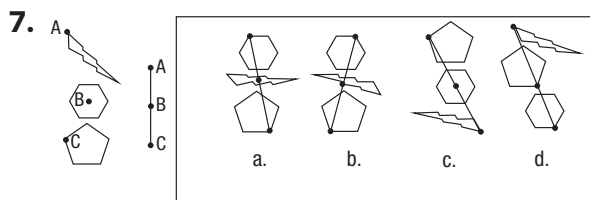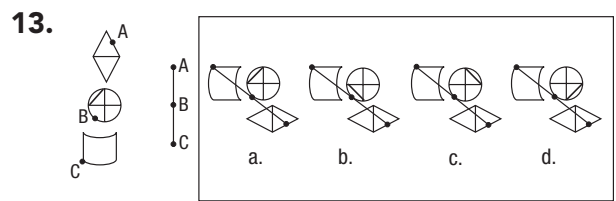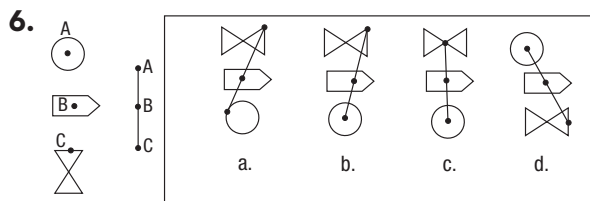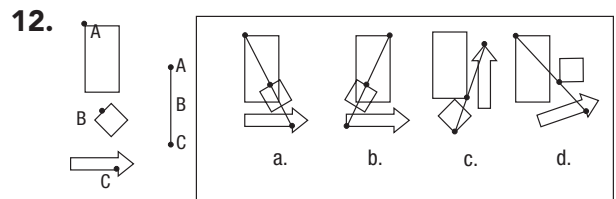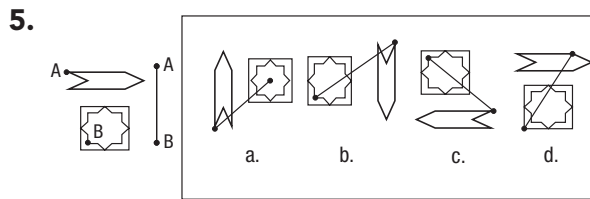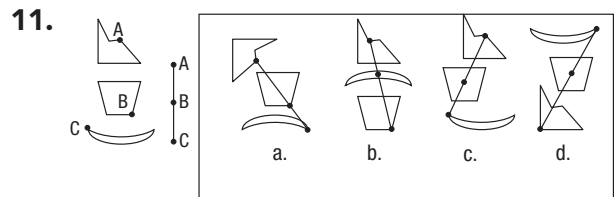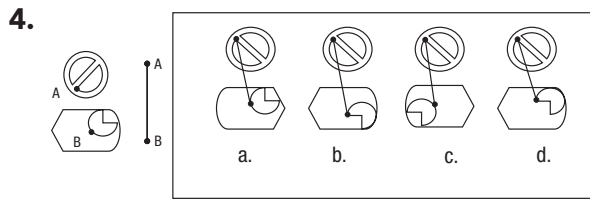
15.

16.
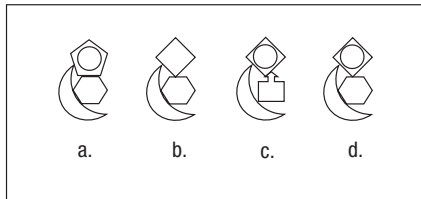
17.
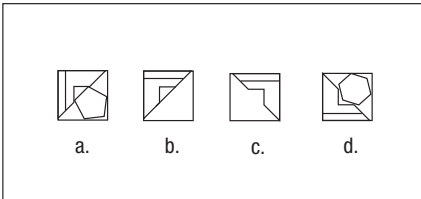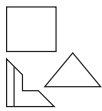
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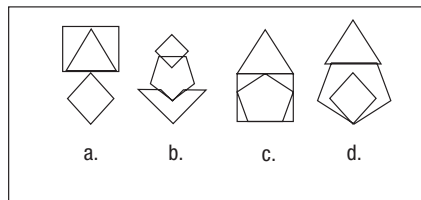
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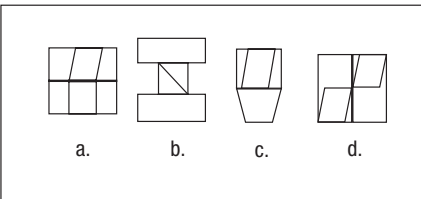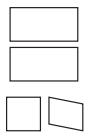
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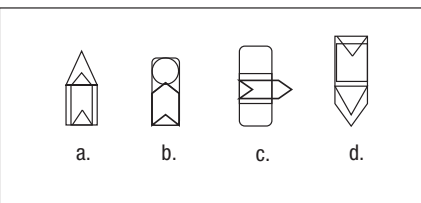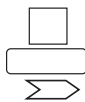
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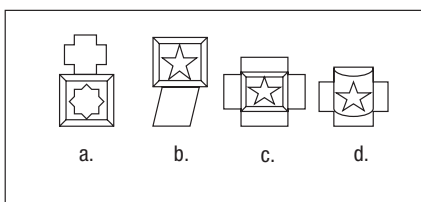
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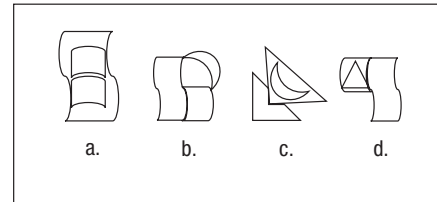
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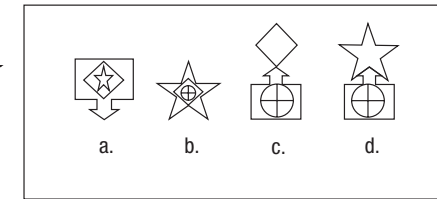
24.

25.

Answers

Part 1: General Science

1. a. Adipose tissue is the connective tissue otherwise known as fat. Adipose is made up of lipids, also referred to as fatty acids or triglycerides.

2. c. The same number of elements must be on both sides of the equation. For example, there are two nitrogen elements on the reactant and product sides of the reaction in the question. There are six hydrogen elements in the products, so six hydrogens are needed on the reactant side. Because hydrogen is present as H_2, three molecules are needed.

3. a. Fungi are decomposers that return nutrients into soil by breaking down nutrients from decaying organic matter. Fungi rely on dead organisms for nutrients, like the dead plant, but this is not a form of symbiosis, which is considered a relationship between living organisms. Choices **b** through **d** are examples of symbiosis.

4. b. When balancing chemical equations, make sure the number of each element is balanced on each side. For example, choice **b** has 4 hydrogen atoms and 4 oxygen atoms on each side of the equation.

5. a. The transport of heat energy by movement of a fluid, in this case air, is convection.

6. b. The first stage of a star similar to the Sun is in the form of a nebula, a cloud of dust, hydrogen, and plasma.

7. b. Genetic code is broken down into codons of three base-pairs. It is helpful to separate the codons as follows: UAC UUC GCU.

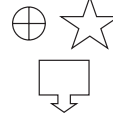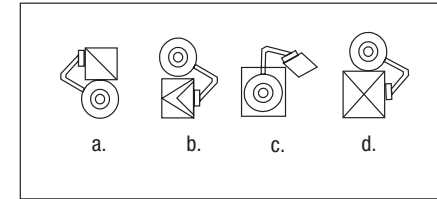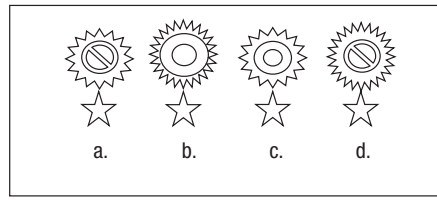**8. a.** When two traits appear to blend, one is not completely dominant over the other. This is referred to as incomplete dominance.

9. b. A decomposition reaction is when a molecule is broken down into its component elements.

10. c. tRNA is responsible for delivering amino acids to the ribosome according to the sequence on mRNA.

11. a. The electron configuration given has 11 electrons, which corresponds to 11 protons in the nucleus. Therefore, the atomic number is 11 and the atomic weight would be determined by the sum of the number of protons and neutrons in the nucleus, which is not given.

12. d. The asteroid belt of the solar system orbits between Mars and Jupiter.

13. b. Alveoli are found in the lungs and are the site of oxygen and carbon dioxide exchange.

14. a. Moving down a column of the periodic table the elements have more electrons in their valence shells, hence the atomic radii are expected to increase.

15. b. After sexual reproduction leads to fertilization, the first stage of development is a single cell zygote. Choices **a** and **c** are later stages in development; the zygote becomes an embryo, which becomes a fetus.

16. d. Pressure and temperature affect the state of substances. To move from liquid to solid, the pressure needs to be increased or its temperature decreased.

17. c. The fruit of a tree is formed after pollination and serves to protect the resulting embryo.

18. d. Temperature differences from incoming solar energy and ocean currents largely affect weather. Temperature differences lead to pressure differences, wind, and precipitation.

19. c. Red-tailed hawks typically eat other animals (primary consumers) for energy, making them secondary consumers. Primary consumers get their energy by eating producers, plants that make their own energy.

20. b. Potential energy is the amount of energy to do work, but not the process of doing work. Choice **b** is a form of electrical energy.

21. b. Halogens are the elements in group 7A, the first family to the left of the noble gases. They all share the valence electron configuration of p^5.

22. d. The only molecule in this list that has a double bond is O_2. Choice **a** has two single bonds, choice **b** has a triple bond, and choice **c** has three single bonds.

23. a. The homozygous dominant parent has a genotype of **XX**, and will always give **X** to its offspring. The homozygous recessive parent has a genotype of **xx**, and will always give **x** to its offspring. Therefore, all the offspring will have the genotype **Xx** and the chance of offspring expressing the recessive trait is 0%.

24. a. Meteorites are the remains of meteors that have survived the entry into the Earth's atmosphere.

25. b. Energy of electromagnetic radiation is proportional to the frequency of its waves. Therefore, the radiation with the most energy has the largest frequency. Radio waves and microwaves have the smallest frequency and X-rays and gamma rays have the largest, with gamma rays being the larger of the two.

Part 2: Arithmetic Reasoning

1. b. This is an addition problem. Arrange the numbers in a column so that the decimal points are aligned: $2.345 + 0.0005 = 2.3455$.

2. a. To arrive at the answer quickly, begin by rounding off the numbers, and you will see that choice **a** is less than 600 pounds, whereas choices **b**, **c**, and **d** are all more than 600 pounds.

3. c. The problem is to find H, the number of years Hazel will take to save $1,000. You are told Laura saves three times faster than Hazel, a ratio of 3:1. Therefore, $3L = H$. You are given $L = 1.5$ years. Substitute: $3(1.5) = H$, or $H = 4.5$ years.

4. a. This is a basic subtraction problem. Line up the decimals and subtract: $2,354.82 - 867.59 = 1,487.23$.

5. b. This is a two-step problem. First, determine what percent of the trees are not oaks by subtracting: $100\% - 32\% = 68\%$. Change 68% to a decimal and multiply: $0.68 \times 400 = 272$.

6. c. This is a basic addition problem. Be sure to align the decimal points before you add $68.8 + 0.6 = 69.4$.

7. a. This is a simple subtraction problem: $\$42.09 - \$6.25 = \$35.84$.

8. c. The labor fee ($25) plus the deposit ($65) plus the basic service ($15) equals $105. The difference between the total bill, $110, and $105 is $5.00, the cost of the arts channels.

9. d. Since 28 of the 35 slices have been eaten, there are $35 - 28 = 7$ slices left. This means $\frac{7}{35}$, or $\frac{1}{5}$ of the loaf is left.

10. c. This is a two-step problem. First, multiply to determine how many pounds of beef were contained in the eight packages: $0.75 \times 8 = 6$. Then add: $6 + 0.04 = 6.04$.

11. d. This is an addition problem. To add these three decimals, line them up in a column so that their decimal points are aligned: $52.50 + 47.99 + 49.32 = 149.81$. Move the decimal point directly down into the answer.

12. b. Change the hours to minutes: 1 hour 40 minutes = 100 minutes; 1 hour 50 minutes = 110 minutes. Now add: 100 minutes + 110 minutes = 210 minutes. Now change back to hours and minutes: 210 minutes ÷ 60 minutes = 3.5 hours.

13. a. This is a subtraction problem. Be sure to align the decimal points: $6.32 - 6.099 = 0.221$.

14. b. This is a multiplication problem. First, multiply 279 by 89. Then, because there are four decimal places, count off four places from the right. Your answer should be 2.4831. Because the 3 in the thousandths place is less than 5, round to 2.48.

15. a. First, change 70% to a decimal, which is 0.7. Then multiply: $70 \times 0.7 = 49$.

16. b. The average is the sum divided by the number of observations: $(11 + 4 + 0 + 5 + 4 + 6) \div 6 = 5$.

17. b. This is an addition problem. Be sure the decimal points are aligned before you add: $0.724 + 0.0076 = 0.7316$.

18. c. The counting principle shows the number of ways an event can occur and tells you to take the total choices for each item and multiply them together: $3 \times 5 \times 2 = 30$.

19. b. This is a division problem: $13.5 \div 4 = 3.375$. Move the decimal straight up into the quotient.

20. b. Set up the problem this way: $\frac{x}{90} = \frac{10}{100}$. If you're getting good at percentages, you may just see the answer, but if you don't, cross multiply: $10 \times 90 = 100x$. Solve: $x = 9$.

21. c. Change the information into a fraction: $\frac{2}{8}$. Now, reduce the fraction: $\frac{1}{4}$.

22. c. First, find the least common denominator of the fractions, which is 6. Then add: $9\frac{2}{6} + 8\frac{5}{6} = 17\frac{7}{6}$, or $18\frac{1}{6}$.

23. c. This is a multiplication problem. Multiply 3.25 times 1.06. Be sure to count four decimal places from the right: $3.25 \times 1.06 = 3.445$.

24. c. This is a division problem with mixed numbers. First, convert the mixed numbers to fractions: $33\frac{1}{2} = \frac{67}{2}$ and $5\frac{1}{4} = \frac{21}{4}$. Next, invert the second fraction and multiply: $\frac{67}{2} \times \frac{4}{21} = \frac{134}{21}$. Reduce to a mixed number: $\frac{134}{21} = 6\frac{8}{21}$. With this result, you know that only six glasses can be completely filled.

25. b. First, ask the question: "$42 is 12% of what number?" Change the percent to a decimal and divide $42 by 0.12. This is equal to $350, which represents the total weekly earnings. Now subtract the amount she spent on DVDs from $350: $350 - $42 = $308. She deposited $308 into her savings account.

26. a. Millie has completed $\frac{16}{52}$, or $\frac{4}{13}$, of the total galleries.

27. b. This is a simple subtraction problem. Line up the decimals and subtract: $46.1 - 40.6 = 5.5$.

28. d. This problem involves two steps: addition and subtraction. Add to determine the amount of money Michael has: $20.00 + $5.00 + $1.29 = $26.29. Then, subtract the amount spent for the ice cream: $26.29 - $4.89 = $21.40.

29. a. This is a multiplication problem. A quarter section contains 160 acres, so you must multiply: $160 \times $1,850 = $296,000$.

30. a. Subtract the months first, then the years. Remember that it is best to write the problem in columns and subtract the right-most column (months) first, then the left-most column (years): 8 months – 7 months = 1 month; 2 years – 1 year = 1 year. So, Brook is 1 year 1 month older than Emilio.

Part 3: Word Knowledge

1. c. *Incredulous* means showing disbelief, or skeptical.

2. b. To *disabuse* someone means to free from error or deception.

3. b. *Laconic* means using few words, or concise.

4. c. Something that is *spurious* is not genuine or authentic.

5. d. *Nadir* means lowest point, or bottom.

6. a. *Allay* means to relieve or soothe.

7. b. *Disingenuous* means to lack candor, candidness, or sincerity.

8. d. *Adversely* means unfavorably, harmfully, or negatively.

9. a. A *courtesy* implies being courteous or mannerly; it is civility.

10. b. A *frail* person is weak and delicate.

11. a. *Recuperate* means to heal; to mend.

12. b. *Meager* and scarce both mean lacking.

13. b. To be *apathetic* is to show little emotion or interest; to be indifferent is to have no particular interest or concern.

14. b. *Surreptitious* is acting in a stealthy or secretive manner.

15. c. *Droll* means oddly humorous or amusing.

16. a. Both *commendable* and admirable mean worthy, qualified, or desirable.

17. c. *Disperse* means to spread, disseminate, or scatter.

18. d. A *domain* is an area governed by a ruler; a territory is an area for which someone is responsible.

19. a. Both *ludicrous* and ridiculous mean absurd or outrageous.

20. c. To *augment* means to increase or expand in size or extent.

21. c. Something *archaic* is marked by characteristics from an earlier period.

22. c. To be *vindictive* is to be vengeful; to be spiteful means to be malicious.

23. d. To *orient* something means to direct or set in position.

24. b. Something that is *expendable* is unnecessary, disposable, or replaceable.

25. d. To *revolutionize* means to radically change or improve something; to transform means to change the appearance or form of something.

26. d. *Malleable* means easily molded, controlled, or pressed into shape. If clay were left overnight uncovered, it would harden, and could no longer be molded.

27. c. *Salutary* means having or producing a beneficial effect. Tutoring would have such an effect on one's grades.

28. b. *Florid* means elaborate or ornate. That is essentially how one would describe a painted ceiling with gold leaf molding.

29. b. *Pristine* means in its original and unspoiled condition. A card in perfect condition would explain why it is a "jackpot."

30. a. While choices **c** and **d** might make sense, *abysmal* means extremely bad.

31. c. Something *precarious* is fraught with danger.

32. b. *Askew* means crooked; not straight or level. A minor earthquake would probably not destroy everything in a house, nor would it leave everything unmoved.

33. a. After jumping in so many puddles, Matthew's sneakers would be *sodden*, which means thoroughly saturated; soaked. Choices **b** and **c** might make sense, but they are not definitions of sodden.

34. c. *Precipitous* means extremely steep. Choices **a** and **b** might make sense—a precipitous slope might indeed be dangerous or slippery—but these words do not define precipitous.

35. b. Something *primeval* belongs to or is from the earliest ages.

Part 4: Paragraph Comprehension

1. a. The passage is focused on how poker has influenced modern culture, specifically in the things people say in common speech. It does mention some historical elements of the game, but that is not the focus of the passage overall.

2. c. The author addresses poker's effect on modern culture throughout the passage, but he or she does not address any of the other topics. Specifically, the author does not teach any strategies of poker, nor does he or she make any value assessments on the game itself.

3. b. The word *toil* means hard work or physical labor. The pioneers are pictured as working hard during the day and relaxing with poker in the evenings.

4. d. To have a *poker face* means to hide one's emotions behind a neutral facial expression, thus preventing one's opponents from knowing whether one is bluffing.

5. a. This idea is expressed in two of the three sentences in the passage and sums up the overall meaning of the passage.

6. d. This is stated in the final paragraph. The other choices are not reflected in the passage.

7. b. The word *diminish* means to reduce or make smaller. Getting fingerprints from everyone present at a crime scene would remove some people from suspicion, thereby diminishing the number of potential suspects.

8. d. The author does not address any moral questions concerning smoking in this passage. The focus is on the various methods used to cure tobacco, and the author does not comment on how it should be used.

9. d. *Curing* is the process of drying plants and other products.

10. b. The second paragraph begins by describing how cigar tobacco is cured, using the air-curing method.

11. b. Something that is *smoldering* is burning on low heat. A charcoal fire used in a barbecue grill generally smolders rather than blazes.

12. d. In the Northern Hemisphere, June 21 would be the beginning of summer; however, according to the passage, it is the beginning of winter in the Southern Hemisphere.

13. b. Logically, if June 21 is called the summer solstice in the Northern Hemisphere, then that same day would be the winter solstice in the Southern Hemisphere.

14. d. See the final sentence of the passage.

15. c. See the second sentence, which defines *ksa*. The other choices are refuted in the passage.

Part 5: Mathematics Knowledge

1. a. Square roots can be multiplied and divided, but they cannot be added or subtracted.

2. d. Start by adding 16 to 20. The sum is 36. Then, divide 36 by 6. The correct answer is 6.

3. c. An angle that is more than 90° is an obtuse angle.

4. d. This is the only choice that includes a 90° angle.

5. b. The simplest way to solve this problem is to cancel the *a* term that occurs in both the numerator and denominator. This leaves $\frac{b-c}{bc}$. This is $\frac{4-(-2)}{4(-2)}$, which simplifies to $-\frac{3}{4}$.

6. d. The symbol means that *a* is "less than or equal to" 5. The only choice that makes this statement false is 6.

7. a. Multiply the whole number by the fraction's denominator: $5 \times 2 = 10$. Add the fraction's numerator to the answer: $1 + 10 = 11$. Now place that answer over the fraction's denominator: $\frac{11}{2}$.

8. d. In this problem, 2 is the base and 5 is the exponent. *Two raised to the power of 5* means to use 2 as a factor five times: $2 \times 2 \times 2 \times 2 \times 2 = 32$.

9. b. Since $y \times y = y^2$, then $2y(y)$ is equal to $2y^2$.

10. d. To solve this problem, you must first find the common denominator, which is 6. The equation then becomes $\frac{3x}{6} + \frac{x}{6} = 4$; then, $\frac{4x}{6} = 4$; and then $4x = 24$, so $x = 6$.

11. b. In a fractional exponent, the numerator (number on top) is the power, and the denominator (number on the bottom) is the root. Since 2 is the denominator, take the square root of 16. Since $4 \times 4 = 16$, 4 is the square root of 16. Then the numerator (power) is 1, so $4^1 = 4$.

12. c. A common error is to think that 1 is a prime number. But, it is not, because one has only 1 factor: itself. The correct answer is 2.

13. b. Isolate the variable by subtracting 50 from both sides of the equation. Then divide both sides by 5. The correct answer is 20.

14. d. If the figure is a regular decagon, it can be divided into 10 equal sections by lines passing through the center. Two such lines form the indicated angle, which includes three of the 10 sections; $\frac{3}{10}$ of 360° is equal to 108°.

15. c. The number 112 is divisible by both 7 and 8 because each can divide into 112 without a remainder; $112 \div 7 = 16$ and $112 \div 8 = 14$. Choice **a** is divisible only by 7, choice **b** is not divisible by either, and choice **d** is divisible only by 8.

16. d. $x^2 + 4x + 4$ factors into $(x + 2)(x + 2)$. Therefore, one of the $(x + 2)$ terms can be canceled with the denominator. This leaves $x + 2$.

17. c. Ask the question, *What number divided by 72 equals 2?* The correct answer is 144.

18. b. Find the correct answer by dividing the area by the given side length, because area = length × width: $72 \div 12 = 6$ inches.

19. c. An algebraic equation must be used to solve this problem. The shortest side can be denoted s. Therefore, $s + (s + 2) + (s + 4) = 24$; $3s + 6 = 24$, and $s = 6$.

20. b. Two equations are used: $T = 4O$, and $T + O = 10$. This gives $5O = 10$, and $O = 2$. Therefore, $T = 8$. The number is 82.

21. d. The first step in solving this problem is to add the fractions to get the sum of $\frac{4x}{4}$. This fraction reduces to x.

22. d. Supplementary angles add up to 180°. When given one and asked to find its supplement, subtract the given angle from 180°. The correct answer is 96°.

23. d. The angles labeled 120° are alternate interior angles of the lines c and d. When the alternate interior angles are congruent (the same measure), the lines are parallel. Therefore, lines c and d are parallel.

24. d. $56{,}515 \div 4 = 14{,}128.75$, or, rounded to the nearest whole number, 14,129.

25. c. Let x equal the number of oranges left in the basket. Three more than seven times as many oranges as five is $7(5) + 3 = 38$. Removing five leaves $x = 38 - 5 = 33$ oranges.

Part 6: Electronics Information

1. a. A circuit breadboard is also called a solderless breadboard. It is typically used in one-of-a-kind or prototype electronic designs as proof-of-concept. Soldered contacts are not used in a circuit breadboard, making it reusable.

2. d. Flux, or a specific material such as ammonium chloride or hydrochloric acid, is used to prevent the formation of oxides, which can act as an inhibitor to electrical flow. It is also added to a solder to make it easier for the flow of solder onto an electronic connection and assists in the fusing of the solder as it cools.

3. c. A cold solder is the result of not sufficiently heating up the metal surface that will be accepting the solder. A cold solder joint will have an unsmooth, unfinished look to it.

4. c. Wire wrapping is a means of assembling electronics. Wires on a circuit board are attached or wound by hand or soldered in place by machine vise.

5. d. This is the schematic symbol for a microphone.

6. d. A multimeter is an electronic measuring instrument that combines several measurement functions in one unit. Some models can be used to test diodes, capacitors, and transistors in addition to the test functions listed as answers.

7. c. 1A (1 amp) is quite a large current for electronics, so mA (milliamps) are often used; "m" (milli) means "thousandth," so 1mA = 0.001A, or 1000mA = 1A.

8. d. This is the schematic symbol for an oscilloscope.

9. d. This is the schematic symbol for an unspecified component.

10. a. An oscilloscope is an electronic test instrument that displays how signal voltage varies over time. The display is usually as a two-dimensional graph of one or more electrical potential differences.

11. c. Bandwidth is measured in the megahertz and will be the limit of the frequency signal that can be measured. Resolution is the accuracy in microseconds.

12. c. Finding the location of the inductor on the schematic will give its function. The higher frequencies coming from the source will be attenuated more by the inductor than the lower frequencies will. An inductor located downstream from the source will result in attenuating higher frequencies, while passing lower frequencies. This is a function of a low pass filter.

13. a. Fiber optic lines, since the medium used is pulses of light, can carry more data than conventional data transmission lines that use packets of electronic energy. The negatives on fiber optic lines are difficult to configure and use and are expensive. Lastly, the glass center of fiber optic lines makes them less robust than a conventional coaxial or metal-cored line.

14. d. Connecting the power early in the process could result in electrical shock.

15. c. A potentiometer is a three-terminal resistor with a rotating knob usually used to control electrical devices, such as volume controls on audio equipment.

16. b. The raster is the grid of pixels that make up the picture. HDTV has more lines, so the picture is sharper. Color or black and white has no bearing on HDTV or SDTV, nor does the data delivery mode (cable or fiber optic).

17. a. CRT stands for cathode ray tube and was typically used for television screens, computer monitors, and oscilloscopes. The advent of plasma and liquid-crystal displays is causing CRTs to become closer to obsolete.

18. d. This is the schematic symbol for an earth ground.

19. d. An output transducer converts an electrical signal to another quantity. A lamp and an LED convert electrical energy to light, while a loudspeaker converts electrical signals to sound.

20. c. Read only memory (ROM) is characterized by data that is permanently stored and cannot be modified, hence the ability to read the data, but not alter it.

Part 7: Auto and Shop Information

1. a. Oil with a higher viscosity means it is thicker, or will have a higher resistance to flow.

2. a. The fluid located in the braking system of an automobile is hydraulic fluid. Hydraulic fluid cannot be compressed, so when you push on the brake pedal, hydraulic fluid from the master cylinder is ported to the brakes on the wheels, in turn forcing the brake mechanisms on the wheels to close.

3. d. All three selections are part of an automobile air-conditioning system.

4. d. All three selections are parts that make up an automobile electrical system.

5. a. The ignition coil helps transform the battery's 12 volts into the thousands of volts needed to fire the spark plugs.

6. c. The combustion part of the internal combustion engine occurs in the cylinders, where the air/fuel mixture is ignited by the spark plug.

7. d. The proper sequence for an internal combustion engine operation is intake, compression, power, exhaust.

8. c. The spark plug fires during the power cycle.

9. d. To complete the exhaust cycle, the exhaust valve must open and the intake valve must be closed.

10. a. The camshaft rotates and actuates a pushrod connected to the rocker arm, which depresses the valve, which is forced back into place by the valve spring.

11. b. Blue smoke is an indication of worn rings in the cylinders, allowing oil to blow by and be burned in the power cycle of the process.

12. c. As with any fire triangle, to get the internal combustion engine operating properly, you will need fire, fuel, and oxygen.

13. c. Approximately 30% of the energy in gasoline is used to power the engine. The remaining 70% ends up as heat and excess energy, needed to be vented from the vehicle via the engine cooling system.

14. b. The Allen wrench is characterized by a hexagonal cross-sectional shape and is used to drive bolts and screws that have a corresponding hexagonal socket in the head.

15. d. The subject screwdriver is a slotted type, thus it would be used to screw in the slotted-head screw.

16. a. A reamer is used to shape or enlarge holes; calipers are used to measure internal and external dimensions. Pipe clamps are used to clamp boards or framing together so they can be bonded by glue.

17. d. A thread gauge is used to determine the thread pitch and diameter of screws.

18. a. A level measures how vertical or horizontal something is. A tachometer measures the revolutions per minute (rpm) of an engine. A hydrometer measures specific gravity of liquids.

19. b. A lathe is a woodworking tool that turns a piece of wood so that rotational cuts can be made to create items such as a baseball bat, a table leg, or baluster spindles.

20. c. The tool shown is an angle grinder and should be used to cut, grind, or polish metal.

21. d. The chuck of a drill tightens on the shank of a drill bit.

22. a. Steel, when used outdoors, needs to be treated and/or painted to keep rust and other degenerative effects of the environ-ment from affecting its structural integrity.

23. b. A trowel is used to smooth, level, spread, or shape substances such as cement, plaster, or mortar.

24. d. A pipe cutter would be used by plumbers to score and cut pipe.

25. a. A glue gun applies adhesive by melting glue sticks.

Part 8: Mechanical Comprehension

1. d. $w_1 \times d_1 = w_2 \times d_2$. 102 pounds $\times$ 6 feet = 68 pounds $\times d_2$. Solving for d_2 gives 9 feet.

2. b. The mechanical advantage of a ramp is determined by its length divided by the height. Since ramp B is much longer (and the slope is much shallower) it provides a greater mechanical advantage and thus less force is required to raise the barrel.

3. a. A single fixed pulley offers no mechanical advantage. Pulleys are used at the top of flagpoles because they change the direction of force required to raise the flag.

4. b. The force constant of the spring is 4 pounds $\div$ 6 inches = $\frac{2}{3}$ pounds per inch. Using the equation, $F = kx$, we have 6 pounds = $\frac{2}{3}$ pounds per inch $\times x$. Solving for x gives 9 inches.

5. c. The area of opening of a pipe is pi times the square of half the diameter. So, the area of pipe A is $\pi(1)^2 = \pi$ and the opening of pipe B is $\pi(2)^2 = 4\pi$. The rate at which liquid flows out of the pipes is equal to the ratio of the area of their opening. A $\div$ B = $\pi \div 4\pi$ = 0.25. Water flows out of pipe B four times faster than pipe A.

6. a. The scale works by balancing the weight of an object on one side of the pivot point with objects of known weight on the other side.

7. c. For an object to float, its weight must be equal to the weight of water it displaces. Steel is much denser than water; however, the overall density of the ship is decreased due to numerous inner rooms filled with air.

8. b. If 9 full turns move the nut 0.75 inches, there are 9 turns $\div$ 0.75 inches = 12 threads per inch.

9. b. In this pulley system, the weight of the load is shared over 2 cables and so the mechanical advantage is 2.

10. a. A glass bottle is the best insulator of the choices given. Thus, it will keep the beverage colder for a longer period of time. Metals such as aluminum are good conductors and will rapidly transfer heat.

11. b. If gear 3 turns counterclockwise, it will lead its neighboring gears (2 and 4) to turn clockwise.

12. a. Since pulley B is four times greater in circumference than pulley A, pulley A must rotate 4 times for every revolution of B. If A rotates at 60 rpm, then B will rotate at 60 rpm $\div$ 4 = 15 rpm.

13. a. Ice is a slippery surface, meaning that it has a very low coefficient of friction. An object sliding on ice will take longer to slow down than it will on the other surfaces.

14. c. Each turn of the pedals will move the bike 54 $\div$ 12 = 4.5 revolutions. If the bike is pedaled at 90 rpm, the rear wheel will rotate at 90 rpm $\times$ 4.5 revolutions = 405 rpm.

15. a. A decrease in air pressure means that air is hitting the outside of the balloon with less force, meaning that the helium inside the balloon will expand.

16. c. $w_1 \times d_1 = w_2 \times d_2$. Daniel is 10 feet away from the pivot point. 225 pounds $\times$ 4 feet = 10 feet $\times w_2$. Solving for w_2 gives 90 pounds.

17. b. Orientation B has the widest base and lowest center of mass compared to orientations A and C.

18. c. The density of an object is unchanged when it is cut in half. Density = mass ÷ volume. If the object is cut in half, both the mass and volume are decreased by half, so the density will remain unchanged.

19. d. 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 = $\frac{l}{h}$ = 27 feet ÷ 3 feet = 9. The force required to pull a 360-pound block up a ramp is 360 pounds ÷ 9 = 40 pounds.

20. a. An object will float on top of a liquid if its density is less than the density of the liquid it is in and sink if its density is greater. In this case, the lead plug is denser than water and mercury, so it will sink to the bottom of the beaker.

21. c. A pulley system of this type has a mechanical advantage of 2. So if Keiko can pull a rope with 120 pounds of force, she will be able to lift a weight of 120 pounds × 2 = 240 pounds.

22. c. $w_1 \times d_1 = w_2 \times d_2$. 450 pounds × 3 feet = $w_2 \times 9$ feet. Solving for w_2 gives 150 pounds.

23. b. After 1 hour, the first man has traveled 25 miles and the second has traveled 15 miles. 25 miles – 15 miles = 10 miles.

24. a. The mechanical advantage (MA) of a ramp is equal to the ratio of ouput force (280 pounds) to input force (70 pounds). It is also equal to the length of the ramp (16 feet) divided by the height gained by the ramp (x feet). The MA is 280 pounds ÷ 70 pounds = 4. So, we know that the length of the ramp (16 feet) divided by the height must equal 4 as well. The height of the ramp must be 4 feet.

25. d. A pulley system of this type has a mechanical advantage of 2. So, if Maria can pull a rope with 100 pounds of force, she will be able to lift a weight of 100 pounds × 2 = 200 pounds.

Part 9: Assembling Objects

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

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