

Part 8

Mathematics Knowledge

Directions

This is a test of your ability to solve 25 general-mathematical problems. You are to select the correct answer from the choices given. Then mark the corresponding space on your answer sheet. Use the scratch paper that has been given to you to do any figuring. Try the following sample problems:

S1. If $x + 2 = 4$, then x equals

- (A) 6
- (B) 4
- (C) 12
- (D) 8

To solve for x , multiply both sides of the equation by 2. $(x + 2) \times 2 = 4 \times 2$ equals $x = 8$. *Correct answer: D.*

S2. What is the area of a square that measures 3 feet on one side?

- (A) 9
- (B) 6
- (C) 12
- (D) 15

To find the area of any rectangle, multiply length times width. A square has sides of equal measure, so $length \times width = 3 \times 3$. The area of the square is 9 square feet. *Correct answer: A.*

Your score on this test is based on the number of questions you answer correctly. Try to answer every question. Don't spend too much time on any one question.

When you begin, be sure to start with Question 1 in Part 8 of your test booklet and Question 1 in Part 8 on your answer sheet.



IF YOU FINISH BEFORE THE TIME IS UP, YOU MAY
CHECK OVER YOUR WORK ON THIS PART ONLY.

Part 8

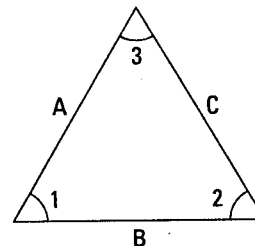
Mathematics Knowledge

Time: 24 minutes; 25 questions

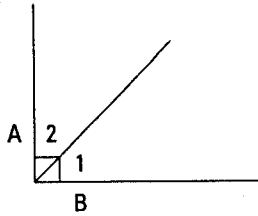
1. $20 + 0.05 =$
(A) 4.0
(B) 40.0
✓(C) 400.0
(D) 0.4
2. The cube of 5 is
✓(A) 125
(B) 25
(C) 15
(D) 50
3. $2.5 \times 3^3 =$
(A) 22.5
(B) 75.0
✓(C) 67.5
(D) 675.0
4. The fourth root of 16 is
(A) 4
(B) 1
(C) 3
✓(D) 2
5. Of the students in Miss Jones' class, 8 have blonde hair, 10 have brown hair, 5 have red hair, 6 have black hair, and 1 has purple hair. What is the probability that a student selected at random will have brown hair?
(A) $\frac{1}{4}$
✓(B) $\frac{1}{3}$
(C) $\frac{2}{5}$
(D) $\frac{1}{2}$
6. 12 yards plus 14 feet divided by 5 equals
(A) 12 feet
(B) $5\frac{1}{5}$ feet
✓(C) 10 feet
(D) $2\frac{1}{2}$ yards
7. $x^3 \times x^4 =$
(A) x^{12}
(B) $2x^7$
(C) $2x^{12}$
✓(D) x^7
8. $(x + 4)(x + 2) =$
(A) $x^2 + 6x + 6$
(B) $x^2 + 8x + 8$
(C) $x^2 + 8x + 6$
✓(D) $x^2 + 6x + 8$
9. $1.5 \times 10^3 =$
(A) 45
(B) 150
✓(C) 1,500
(D) 15
10. A gorilla has b bunches of bananas. He acquires 3 bunches from passing tourists. How many bunches of bananas does the gorilla now have?
(A) $b - 3$
✓(B) $b + 3$
(C) $b \times 3$
(D) $3 - b$
11. A small housing development is laid out in a rectangle measuring 1050 yards x 500 yards. What is the largest number of 150-yard by 100-yard lots that can be obtained from this rectangle?
✓(A) 35
(B) 6
(C) 350
(D) 27

Go on to next page 

12. If $a = 4$, then $a^3 + a =$
 (A) 4
 (B) 12
 (C) 64
 ✓(D) 16
13. Five runners are running a race. How many different ways could the runners finish the race?
 (A) 25
 (B) 125
 ✓(C) 120
 (D) 15
14. $(900 \times 2) + 6 =$
 (A) 30
 ✓(B) 300
 (C) 150
 (D) 3,000
15. If $x = 2$, then $x^x \times x =$
 ✓(A) 8
 (B) $2x^x$
 (C) 4
 (D) 6
16. If $(5 + 1)(6 + 3)(8 - 5) = (3 + 3)x$, then $x =$
 (A) 12
 (B) 3
 (C) 4
 ✓(D) 6
17. $\sqrt{49} \times \sqrt{64} =$
 ✓(A) 56
 (B) 15
 (C) 42
 (D) 3,136
18. Which of the following fractions is the largest?
 (A) $\frac{3}{5}$
 (B) $\frac{3}{8}$
 (C) $\frac{7}{10}$
 ✓(D) $1\frac{1}{6}$
19. If $2 + x \geq 4$, what is the value of $x \geq$?
 (A) 6
 ✓(B) 2
 (C) 4
 (D) $\frac{1}{2}$
20. If a circle has a radius of 12 feet, what is its circumference most nearly?
 (A) 24 feet
 ✓(B) 72 feet
 (C) 75 feet
 (D) 36 feet
21. An aquarium measures 16 inches long by 8 inches deep by 18 inches high. What is its volume?
 ✓(A) 2,304 cubic inches
 (B) 128 cubic inches
 (C) 42 cubic inches
 (D) 288 cubic inches



22. Triangle ABC (shown above) is a(n):
 (A) right triangle
 (B) obtuse triangle
 ✓(C) equilateral triangle
 (D) isosceles triangle
23. The sum of the measures of the angles of a trapezoid is:
 ✓(A) 360 degrees
 (B) 540 degrees
 (C) 180 degrees
 (D) 720 degrees



24. In the Angle AB (shown above), Angles 1 and 2 are:
- (A) supplementary
 - (B) complimentary
 - (C) both obtuse
 - (D) both right angles

25. Every year, a number of students enroll in b number of state colleges. What is the total number of students who enroll in state colleges during a 10-year period?
- (A) $10a$
 - (B) $\%_0$
 - (C) $(a + b)10$
 - (D) $\% \times 10$



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Part 7: Auto & Shop Information Answers

The Auto & Shop Information subtest is fairly straightforward. You either know the information, or you don't. Not knowing the info may not matter to you as long as the career you want doesn't require a subtest score in this area. But, if you do need to do well on this subtest, and you've missed more than five answers, you need to review the material in Chapter 11. You may even want to take a class at a nearby community college or at least hang out at the garage and help some mechanics for a couple of weeks.

- | | | | | |
|------|-------|-------|-------|-------|
| 1. D | 6. D | 11. C | 16. B | 21. A |
| 2. B | 7. D | 12. D | 17. B | 22. B |
| 3. A | 8. B | 13. A | 18. D | 23. A |
| 4. C | 9. A | 14. C | 19. C | 24. D |
| 5. C | 10. C | 15. B | 20. C | 25. A |

Part 8: Mathematics Knowledge Answers

The Mathematics Knowledge subtest is more difficult than the Arithmetic Reasoning subtest, but doing well on this subtest is just as important. You need a solid score on this subtest to even be admitted to the military. If you missed more than a few answers, or you ran out of time before you finished, you have a date with the books (Chapter 7 is a great place to start). Getting in touch with a math teacher at your high school or a local community college (or at least finding a good basic-algebra textbook) can help.

- C. $20 \div 0.05 = 20 \div \frac{1}{20} = 20 \times \frac{20}{1} = 400$.
- A. The cube of 5 = $5 \times 5 \times 5 = 125$.
- C. $2.5 \times 3^3 = 2.5 (3 \times 3 \times 3) = 2.5 \times 27 = 67.50$.
- D. $2^4 = 16$; the fourth root of 16 is 2.
- B. 30 students are in the class. 10 have brown hair. Random selection has a probability of selecting a brown haired student 10 out of 30 times, which is the same as $\frac{10}{30}$ or $\frac{1}{3}$.
- C. Convert 12 yards and 14 feet to feet: $(12 \text{ yards} \times 3 \text{ feet per yard}) + 14 \text{ feet} = 36 \text{ feet} + 14 \text{ feet} = 50 \text{ feet}$. Divide by 5 as instructed: $50 \text{ feet} \div 5 = 10 \text{ feet}$.
- D. If two powers have the same base, they can be multiplied by keeping the base and adding the powers together.
- D.

$$\begin{array}{r} x+2 \\ x+4 \\ \hline x^2+4x \\ + 2x+8 \\ \hline x^2+6x+8 \end{array}$$
- C. $1.5 \times 10^3 = 1.5 \times (10 \times 10 \times 10) = 1.5 \times 1,000 = 1,500$.
- B. The gorilla had b bananas. He added three. So the answer is $b + 3$.
- A. The area of the development = $1,050 \text{ yards} \times 500 \text{ yards} = 525,000 \text{ square yards}$. Each lot = $150 \times 100 \text{ yards} = 15,000 \text{ square yards}$. $525,000 \div 15,000 = 35 \text{ lots}$.
- D. Substitute 4 for all a 's in the problem. $4^3 + 4 = (4 \times 4 \times 4) + 4 = 64 + 4 = 68$.

13. C. To determine all the possible ways in which the runners could finish the race (called permutations), solve for factorial. 5 factorial ($5!$) = $5 \times 4 \times 3 \times 2 \times 1 = 120$.
14. B. $(900 \times 2) \div 6 = 1,800 \div 6 = 300$.
15. A. Substitute 2 for all x 's in the problem. $2^2 \times 2 = 4 \times 2 = 8$.
16. D. Solve the first half of the equation. $(6)(2)(3) = 36$. Therefore, $36 = (3 + 3)x$, which turns into $36 = 6x$. Isolate x .
- $$36 \div 6 = 6x \div 6$$
- $$6 = x$$
- To check your answer, substitute 6 for x .
17. A. The square root of 49 is 7; the square root of 64 is 8. $7 \times 8 = 56$.
18. D. Find a common denominator for the fractions. In this case, 80 works for all the fractions. Convert all the fractions: $\frac{2}{5} = \frac{32}{80}$; $\frac{3}{8} = \frac{30}{80}$; $\frac{7}{10} = \frac{56}{80}$; and $\frac{13}{16} = \frac{65}{80}$. Comparing the fractions, you can see that $\frac{13}{16}$ ($\frac{65}{80}$) is the largest fraction.
19. B. Solve as you would solve for any unknown. $2 + x \geq 4 = 2 + x - 2 \geq 4 - 2$. Or, $x \geq 2$. To check your answer, substitute 2 for x . $2 + 2 \geq 4$. True, so the answer is correct.
20. C. Circumference equals pi times diameter, and diameter is equal to two times the radius. Or $C = \pi d$, and $d = 2r$. $C = \pi 24$. If you round π to 3.14, the answer is about 75.36 or about 75 feet.
21. A. Volume equals length times width times height ($V = lwh$). $16 \times 8 \times 18 = 2,304$ cubic inches.
22. C. In an equilateral triangle, all sides are equal, and all angles are equal.
23. A. All quadrilaterals have angles that total 360 degrees.
24. B. If the sum of two angles equals 90 degrees, they're called complementary angles.
25. A. The number of state colleges doesn't matter, so b is irrelevant. If a students enroll every year, then $a \times 10$ enroll over a period of 10 years.

Part 9: Mechanical Comprehension Answers

The Mechanical Comprehension subtest is important only if you want to pursue a military career that requires a good score on this subtest. Otherwise, spend your time studying more important areas of the ASVAB. If you did well on this subtest, take it again on the second sample ASVAB just to make sure your results are consistent from test to test. Chapter 12 contains a mechanical comprehension review.

- A. An induction clutch is a magnetic clutch.
- B. Mechanical advantage can be calculated as Length of Effort Arm \div Length of Resistance Arm. $MA = 8 \div 2 = 4$.
- D. The box with the largest area on the bottom will have the shortest sides. If length \times width \times height = volume, and all the boxes have equal volume, then the sides must be shortest on the box with the largest area on the bottom. Calculate the area of each box bottom: No. 1 = 20 square inches; No. 2 = 35 square inches; No. 3 = 48 square inches; and No. 4 = 27 square inches. No. 3, which has the largest area, will have the shortest sides.
- C. Cat B landing on the seesaw will propel Cat A into the air.
- A. Power equals force divided by area in square inches ($P = \frac{F}{A}$). This formula can also be stated as $F = A \times P$. Substitute the known quantities. $F = 15 \times 24 = 360$ pounds.

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Mathematics Knowledge

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S1. If $x - 2 = 4$, then x equals

- (A) 6
- (B) 4
- (C) 2
- (D) 1

To solve for x , add 2 to both sides of the equation. ($x - 2 + 2 = 4 + 2$) equals $x = 6$. *Correct answer: A*

S2. What are the factors of 12?

- (A) 1 and 12 only
- (B) 2 and 3 only
- (C) 2, 3, 4, and 6
- (D) 3 and 4 only

Factors are numbers, not including 1 or the composite number itself, that can divide a composite number. *Correct answer: C*

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Part 8

Mathematics Knowledge

Time: 24 minutes; 25 questions

- $x^2 \times x^4 =$
 (A) x^6
(B) x^8
(C) $2x^6$
(D) $2x^8$
- If a rectangle has a perimeter of 36 feet, and it is 4-feet wide, what is its area?
 (A) 56 square feet
(B) 128 square feet
(C) 112 square feet
(D) 16 square feet
- The cube root of 64 is
(A) 3
(B) 9
(C) 2
 (D) 4
- A scientist has b beakers in his lab. His assistant, Frank N. Stein, accidentally breaks 6 beakers. How many beakers remain?
(A) $b + 6$
(B) $6b$
 (C) $b - 6$
(D) $b + 6$
- The reciprocal of $\frac{1}{6}$ is
(A) 1
(B) 3
 (C) 6
(D) $\frac{1}{3}$
- If $0.05 + x = 1$, then $x =$
 (A) 0.05
(B) 0.5
(C) 50.0
(D) 5.0
- If $x = 5$, then $x^2 \times 2x =$
(A) 25
(B) 50
(C) 125
 (D) 250
- $(3 \times 2)(7 - 2)(6 + 2) = (6 \times 4)x$. What is the value of x ?
(A) -5
(B) 5
 (C) 10
(D) 1
- $2x - 6 = x + 5$
(A) 3
 (B) 11
(C) 7
(D) 5
- If $I = prt$, and $p = \$1,000$, $r = 7\%$, and $t = 1$, what does I equal?
(A) \$35
(B) \$1,000
(C) \$700
 (D) \$70
- If $4x + 4 = 13 + x$, then x equals
(A) 4
(B) 6
 (C) 3
(D) 12
- A circle has a radius of 5 inches. What is its approximate area?
 (A) 78.5 inches
(B) 70.0 inches
(C) 314.0 inches
(D) 25.0 inches

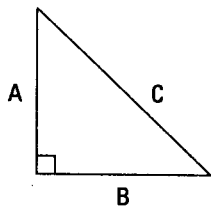
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13. A crate is 12-inches long, 4-inches wide, and 6-inches deep. What is the volume of the crate?

(A) 22 cubic inches
 (B) 48 cubic inches
 (C) 44 cubic inches
 (D) 288 cubic inches

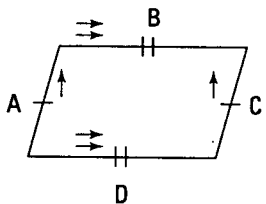
14. A tube has a radius of 3 inches and a height of 5 inches. What is its approximate volume?

(A) 34 cubic inches
 (B) 141 cubic inches
 (C) 565 cubic inches
 (D) 45 cubic inches



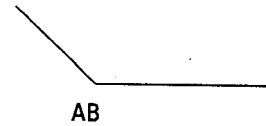
15. Triangle ABC (shown above) is a(n):

(A) right triangle
 (B) equilateral triangle
 (C) scalene triangle
 (D) isosceles triangle



16. The figure above is what type of quadrilateral?

(A) square
 (B) rhombus
 (C) trapezoid
 (D) parallelogram



17. Angle AB (shown above) is a(n):

(A) complementary angle
 (B) supplementary angle
 (C) acute angle
 (D) obtuse angle

18. If a number of recruits are processed through b number of processing centers every decade, what is the average annual number of recruits processed?

(A) $a/10$
 (B) $b/10$
 (C) $ab - 10$
 (D) $ab/10$

19. A square box has a volume of 64 cubic inches. What is its perimeter?

(A) 8 inches
 (B) 16 inches
 (C) 64 inches
 (D) 32 inches

20. A cube has a volume of 64 cubic inches. What is its surface area?

(A) 16 square inches
 (B) 64 square inches
 (C) 96 square inches
 (D) 32 square inches

21. $(x^3)^3 =$

(A) $3x^3$
 (B) x^6
 (C) x^9
 (D) $2x^6$

22. $4! =$

(A) 16
 (B) 40
 (C) 0
 (D) 24

23. If $a^3 + b^3 = a^3 + x^3$, then $b =$

(A) $b^3 - a^3$

(B) x

(C) $a^3 - b^3$

(D) a

24. $(x + 3)(x + 3) =$

(A) $x^2 + 6x + 6$

(B) $x^2 + 9x + 3$

(C) $x^2 + 6x + 9$

(D) $x^2 + 9x + 6$

25. $(y^2)^3 =$

(A) y^5

(B) y^6

(C) y^3

(D) $3y^2$



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Part 7: Auto & Shop Information Answers

Don't forget that you need to do well on this subtest to qualify for certain military jobs. If you don't care about those jobs, you don't need to care about this subtest. But, if you do care about those jobs, and you're still missing more than a few questions on this subtest, it's time for more extreme measures — like taking your mother's car apart and putting it back together (or going back over Chapter 11).

1. D	6. D	11. A	16. C	21. A
2. C	7. B	12. D	17. D	22. D
3. B	8. D	13. C	18. B	23. B
4. A	9. D	14. C	19. B	24. D
5. C	10. B	15. A	20. C	25. B

Part 8: Mathematics Knowledge Answers

Because doing well on this subtest is a must to even enlist in the military (it counts toward your AFQT score), spend a lot of your study time working on your math skills. (Another large portion of your study time should be spent working on the word sections of the ASVAB — these sections also count toward your AFQT score.) If you're still not getting the scores that you need on this subtest, consider hiring a tutor to help you get up to speed. (Running through the information in Chapter 7 again can help, too.)

- A. If two exponents have the same base, you can multiply them by keeping the base and adding the exponents together.
- A. To find area, multiply length times width ($A = lw$). To determine the length, subtract two times the width from the perimeter: $36 - 2(4) = 36 - 8 = 28$. Then divide the remainder by 2 to determine the length of one side: $28 \div 2 = 14$. Then multiply length times width to determine the area: $14 \times 4 = 56$.
- D. The cube of 4 is $4 \times 4 \times 4 = 64$, so 4 is the cube root of 64.
- C. If b is the number of beakers, and 6 beakers are taken away, then $b - 6$ is the answer.
- C. A reciprocal is the number by which a number can be multiplied to produce 1. So the reciprocal of $\frac{1}{6}$ is 6 because $\frac{1}{6} \times 6 = 1$.
- A. Multiply both sides of the equation by 0.05 to isolate x : $0.05 + x \times 0.05 = 1 \times 0.05$ or $x = 0.05$. Check by substituting 0.05 for x in the original equation.
- D. Substitute 5 for x : $5^2 \times 2(5) = 25 \times 10 = 250$.
- C. Solve the left side of the equation first. $(6)(5)(8) = 240$. Therefore, $240 = (6 \times 4)x$, which equals $240 = 24x$. Now isolate x by dividing both sides of the equation by 24: $240 \div 24 = 24x \div 24$ or $10 = x$. Check your answer by substituting 10 for x in the original equation.
- B. Isolate x on one side of the equation:

$$2x - 6 = x + 5$$

$$2x - 6 - x = x + 5 - x$$

$$x - 6 = 5$$

$$x - 6 + 6 = 5 + 6$$

$$x = 11$$

Check by substituting 11 for x in the original equation.

10. D. Solve for I . $I = (1,000)(7\%)(1)$ or $I = (1,000)(0.07)(1) = 70$.

11. C. Isolate x on one side of the equation:

$$4x + 4 = 13 + x$$

$$4x + 4 - x = 13 + x - x$$

$$3x + 4 = 13$$

$$3x + 4 - 4 = 13 - 4$$

$$3x = 9$$

$$3x \div 3 = 9 \div 3$$

$$x = 3$$

Then substitute 3 for x in the original equation to check for accuracy.

12. A. The area of a circle is $A = \pi r^2$. $A = \pi 5^2$. π is approximately 3.14, so 3.14×25 means A is approximately 78.5 inches.

13. D. Volume is length times width times height ($V = lwh$). In this problem,
 $V = 12 \times 4 \times 6 = 288$.

14. B. For cylinders, Volume = $\pi r^2 h$. In this problem, $V = \pi(3^2)(5)$. Assume π is approximately 3.14. V is approximately equal to $(3.14)(9)(5)$ or 141 cubic inches.

15. A. A right triangle has one right angle (one 90-degree angle).

16. D. Parallelograms have opposite sides of equal length.

17. D. Angles measuring more than 90 degrees are obtuse angles.

18. A. The number of processing centers is irrelevant, so b isn't needed in the calculation. a number of recruits are processed every 10 years, so $a + 10$ or $a/10$ yields the average processed per year.

19. B. Volume equals length times width times height ($V = lwh$). In this case, $V = 64$, so one side of the box is 4-inches long. The cube root of 64 produces this number: $64 = 4 \times 4 \times 4$. Find the perimeter by adding the four sides together: $4 + 4 + 4 + 4 = 16$.

20. C. Volume is calculated by multiplying length times width times height ($V = lwh$). Because the edges are equal on a cube, each edge is 4 inches. The cube root of 64 produces this number: $64 = 4 \times 4 \times 4$. The area of one side of the cube is $4 \times 4 = 16$, and because a cube has 6 sides, you multiply 16×6 to find the surface area of the cube, 96 inches.

21. C. $(x^3)^3$ is the same as $(x^3)(x^3)(x^3)$. Multiply exponents with the same base by keeping the base and adding the exponents: $(x^3)(x^3)(x^3) = x^9$.

22. D. $4!$ (4 factorial) = $4 \times 3 \times 2 \times 1 = 24$.

23. B. To solve, subtract a^3 from both sides of the equation:

$$a^3 + b^3 - a^3 = a^3 + x^3 - a^3$$

$$b^3 = x^3$$

$$b = x$$

24. C. $x + 3$

$$\begin{array}{r} x + 3 \\ x^2 + 3x \\ + \quad 3x + 9 \\ \hline x^2 + 6x + 9 \end{array}$$

25. B. $(y^2)^3$ is the same as $(y^2)(y^2)(y^2)$. Multiply exponents with the same base by keeping the base and adding the exponents: $(y^2)(y^2)(y^2) = y^6$.

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This is a test of your ability to solve 25 general mathematical problems. You are to select the correct answer from the choices given. Then mark the corresponding space on your answer sheet. Use the scratch paper that has been given to you to do any figuring you wish. Try the following sample problems:

S1. If $x + 3 = 5$, then x equals

- (A) 8
- (B) 85
- (C) 2
- (D) 87

To solve for x , subtract 3 from both sides of the equation. $x + 3 - 3 = 5 - 3$ equals $x = 2$. *Correct answer: C.*

S2. $3^3 =$

- (A) 27
- (B) 89
- (C) 86
- (D) 83

Three cubed = $3 \times 3 \times 3 = 27$. *Correct answer: A.*

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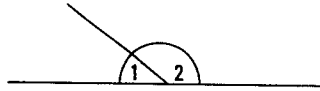
Part 8**Mathematics Knowledge**

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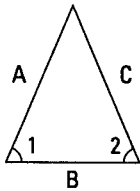
- If $y = 6$, then $2y \times y =$
(A) 12
 (B) 72
(C) 18
(D) 242
- If $0.05x = 1$, then x equals
(A) $\frac{1}{20}$
 (B) 20
(C) 10
(D) 5
- $\frac{3}{4}$ of recruits overslept and missed breakfast. $\frac{1}{3}$ of those who didn't oversleep couldn't find the mess hall and missed breakfast. What fraction of recruits ate breakfast?
(A) $\frac{3}{4}$
(B) $\frac{1}{4}$
 (C) $\frac{1}{6}$
(D) $\frac{1}{3}$
- A baker has s pounds of sugar to use in baking. After she uses 50 pounds to make donuts, how much sugar does she have left?
(A) $s + 50$
(B) $50 - s$
 (C) $s - 50$
(D) $s + 50$
- Of the pizzas to be delivered on a given night, 6 are pepperoni, 7 are hamburger, 4 are cheese, and 3 are "with everything." What is the probability that a randomly selected pizza is pepperoni?
(A) $\frac{1}{2}$
(B) $\frac{2}{5}$
 (C) $\frac{3}{10}$
(D) $\frac{2}{3}$
- $x \times x^2 =$
(A) x^2
(B) $2x$
(C) $2x^2$
 (D) x^3
- A bakery sells $\frac{1}{3}$ of its apple fritters by 8 a.m. and $\frac{1}{2}$ of the remaining fritters by 10 a.m. What fraction of the original number of fritters remains?
(A) $\frac{2}{3}$
 (B) $\frac{1}{3}$
(C) $\frac{1}{6}$
(D) $\frac{2}{5}$
- $(3 \times 3)(5 - 3)(6 + 2) = x^2$. What is the value of x ?
(A) 6
 (B) 12
(C) 144
(D) 64
- If $-5x = 25$, x equals
 (A) -5
(B) 5
(C) 10
(D) 0
- A circle measures 12 feet in diameter. What is its area to the nearest foot?
(A) 452
(B) 24
 (C) 113
(D) 48

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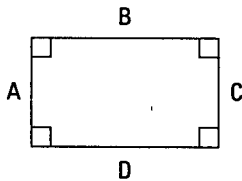
11. A square box has 6-inch sides. What is its volume?
 (A) 18 cubic inches
 (B) 216 cubic inches
 (C) 12 cubic inches
 (D) 36 cubic inches



12. A cylinder has a diameter of 10 inches. What is its approximate area?
 (A) $\pi(10^2)$
 (B) $\pi(25)$
 (C) $\pi(5)$
 (D) $\pi(10^2)(10)$
13. A cylinder has a diameter of 12 inches and a height of 10 inches. What is its approximate volume?
 (A) 4,521 cubic inches
 (B) 120 cubic inches
 (C) 1,130 cubic inches
 (D) 1,440 cubic inches



14. Triangle ABC as shown above is a(n):
 (A) equilateral triangle
 (B) right triangle
 (C) scalene triangle
 (D) isosceles triangle



15. The angles of the quadrilateral above
 (A) are all right angles.
 (B) each equal 45 degrees.
 (C) are all unequal.
 (D) total 180 degrees.

16. In the above figure, the sum of Angles 1 and 2 equals
 (A) 180 degrees
 (B) 90 degrees
 (C) 45 degrees
 (D) 360 degrees
17. If A textbooks are sold to B students every semester, how many textbooks are sold in a typical 9-month academic year?
 (A) $2\frac{3}{8}$
 (B) $\frac{1}{2}A$
 (C) 2A
 (D) $AB\frac{1}{2}$
18. A cube has a volume of 64 cubic inches. What is the length of one side of the cube?
 (A) 4 inches
 (B) 16 inches
 (C) 8 inches
 (D) 32 inches
19. $(x^3)^2 =$
 (A) x^5
 (B) x^6
 (C) x^9
 (D) $2x^3$
20. If I inches of rain fall in one minute, how many inches fall in H hours?
 (A) $IH + 60$
 (B) $60I - H$
 (C) IH
 (D) $60IH$
21. If $x = y$, $6 + 4(x - y) =$
 (A) $6xy + 4$
 (B) $6 + 4xy$
 (C) $10x - 10y$
 (D) 6

22. $\sqrt{820}$ is a number between

- (A) 20 and 30
- (B) 10 and 20
- (C) 80 and 90
- (D) 40 and 50

23. $(x + 2)(x + 2) =$

- (A) $x^2 + 2x + 4$
- (B) $x^2 + 4x + 4$
- (C) $x^2 + 4x + 2$
- (D) $x^2 + 2x + 0$

24. Evaluate the expression $6a - 3x - 2y$, if $a = 3$, $x = 7$, and $y = 4$.

- (A) -5
- (B) -40
- (C) 31
- (D) 40

25. $(x + 4)(3x + 5)$

- (A) $3x^2 + 9x + 20$
- (B) $3x^2 + 17x + 15$
- (C) $3x^2 + 17x + 20$
- (D) $3x^2 + 9x + 20$



IF YOU FINISH BEFORE THE TIME IS UP, YOU MAY
CHECK OVER YOUR WORK ON THIS PART ONLY.

1. C	18. A	35. E	52. E	69. B
2. C	19. B	36. D	53. A	70. B
3. D	20. E	37. B	54. D	71. E
4. B	21. C	38. D	55. B	72. E
5. E	22. D	39. A	56. D	73. E
6. A	23. C	40. C	57. B	74. A
7. C	24. C	41. E	58. E	75. C
8. A	25. A	42. C	59. C	76. C
9. E	26. E	43. A	60. D	77. B
10. D	27. B	44. D	61. C	78. E
11. B	28. D	45. B	62. D	79. B
12. C	29. C	46. D	63. C	80. D
13. C	30. D	47. B	64. D	81. D
14. B	31. C	48. E	65. A	82. E
15. E	32. B	49. C	66. B	83. C
16. D	33. A	50. C	67. E	84. A
17. D	34. E	51. A	68. D	

Part 7: Auto & Shop Information Answers

The ASVAB gurus haven't revised the Auto & Shop Information subtest in years, so you may have to know info that doesn't apply to newer cars — like the purpose of a carburetor. To do well on this subtest, review Chapter 11, which we base on the older information this subtest tests you on.

1. D	6. B	11. C	16. B	21. C
2. B	7. A	12. D	17. B	22. D
3. D	8. C	13. B	18. C	23. C
4. C	9. B	14. D	19. B	24. B
5. D	10. D	15. A	20. A	25. A

Part 8: Mathematics Knowledge Answers

The Mathematics Knowledge subtest is used to determine whether you qualify for enlistment, so you need to do well. If you're still missing too many questions, you may need to take more drastic measures like enrolling in a basic-algebra class at a local community college. If your scores are improving, keep hitting the books and testing yourself up until the day of the ASVAB. Turn to Chapter 7 for more information.

1. **B.** Substitute 6 for y in the equation: $2(6) \times 6 = 12 \times 6 = 72$.
2. **B.** Divide both sides of the equation by 0.05 to isolate x : $0.05x + 0.05 = 1 + 0.05$, or $x = 20$. To check your answer, substitute 20 for x in the original equation.

3. C. If $\frac{3}{4}$ of the recruits overslept, then $\frac{1}{4}$ didn't. If $\frac{1}{3}$ of those recruits still missed breakfast, then $\frac{2}{3}$ of the $\frac{1}{4}$ didn't miss breakfast. $\frac{1}{4} \times \frac{2}{3} = \frac{2}{12} = \frac{1}{6}$. $\frac{1}{6}$ of the recruits didn't miss breakfast.
4. C. s is the amount of sugar the baker had before she made the donuts. Taking away 50 pounds, the amount of sugar used, gives you $s - 50$.
5. C. There are 20 total pizzas. The probability of one of them being a pepperoni pizza is $\frac{2}{20}$, or $\frac{1}{10}$.
6. D. If two powers have the same base, they can be multiplied by keeping the base and adding the exponents together. In this case, x is the same as x^1 .
7. B. If the bakery sells $\frac{1}{3}$ of the fritters by 8 a.m., then $\frac{2}{3}$ are unsold. $\frac{1}{2}$ of the $\frac{2}{3}$ remain unsold by 10 a.m. $\frac{1}{2} \times \frac{2}{3} = \frac{2}{6}$, or $\frac{1}{3}$. $\frac{1}{3}$ of the apple fritters remain unsold.
8. B. First solve the left side of the equation: $(9)(2)(8) = 144$. So $x^2 = 144$. Find the square root of each side: $x = 12$.
9. A. Isolate x by dividing each side of the equation by -5 :
- $$\begin{aligned} -5x + -5 &= 25 + -5 \\ x &= -5 \end{aligned}$$
10. C. The area of a circle equals π times the radius squared. The radius is $\frac{1}{2}$ the diameter. $A = \pi r^2$. $A = \pi 6^2 = \pi 36$. If π is approximately 3.14, the area of the circle is approximately 3.14×36 , or 113 feet.
11. B. Volume equals length times width times height ($V = lwh$): $6 \times 6 \times 6 = 216$ cubic inches.
12. B. The area of a cylinder is $A = \pi r^2$. In this problem, $A = \pi 5^2 = \pi(25)$. Radius is half the diameter.
13. C. For cylinders, Volume = $\pi r^2 h$. Since the radius is half the diameter, the problem can be calculated this way: $V = \pi(6^2)10$. $V = \pi(36)10$. If π is approximately 3.14, then $3.14 \times 36 \times 10 = 1,130$ cubic inches.
14. D. In an isosceles triangle, Sides A and C are equal, and Angles 1 and 2 are equal.
15. A. Rectangles have four equal angles, and all angles are right angles.
16. A. Supplementary angles always equal 180 degrees.
17. C. The number of students who buy textbooks is irrelevant, so B isn't used. An academic year consists of 2 semesters, so $A \times 2$, or $2A$, is correct.
18. A. Volume equals length times width times height ($V = lwh$). Finding the cube root of 64 shows that each edge measures 4 inches.
19. B. $(x^3)^2$ is the same as $(x^3)(x^3)$. To multiply exponents with the same base, keep the base and add the exponents: $(x^3)(x^3) = x^6$.
20. D. To find out how much rain falls in an hour, multiply the amount that falls in one minute by 60 because 60 minutes make up an hour. In H hours, the amount of rain is $60IH$.
21. D. $6 + 4(x - y) = 6 + 4x - 4y$. Because $x = y$, $4x = 4y$. Therefore, $4x - 4y = 4x - 4x = 0$, and $6 + 0 = 6$.
22. A. $20^2 = 400$, and $30^2 = 900$, so the range of 20 to 30 is correct.
23. B.

$$\begin{array}{r} x + 2 \\ \underline{x + 2} \\ x^2 + 2x \\ + \quad \underline{2x + 4} \\ x^2 + 4x + 4 \end{array}$$

24. A. Replace the unknowns with the numbers given. $(6 \times -3) - (3 \times -7) - (2 \times 4) = -18 + 21 - 8 = -5$.
25. C.

$$\begin{array}{r} x + 4 \\ 3x + 5 \\ \hline 3x^2 + 12x \\ + \quad \quad 5x + 20 \\ \hline 3x^2 + 17x + 20 \end{array}$$

Part 9: Mechanical Comprehension Answers

If you need to do well on the Mechanical Comprehension subtest, don't forget to apply your math skills to the concepts. But simply using your common sense can help you quite a bit, too. For example, you may not know exactly *why* a metal spoon feels colder than a wooden spoon when they're at the same temperature, but at least you know that it feels colder. And knowing that may help you answer a question correctly. (A metal spoon is a better conductor of heat — now you also know the reason.) See Chapter 12 for more information on Mechanical Comprehension.

1. B. The teeth of helical gears are slanted.
2. B. The cat is closer to Pillar B, so Pillar B bears more weight.
3. B. Wheel B has to make more revolutions than Wheel A to cover the same amount of distance, so it will go slower.
4. A. E stands for *effort needed*. 30 (weight of the cat) $\times 2$ (length of resistance arm) = $x \times 6$ (length of effort arm). Do a little multiplication, and you get $60 = 6x$. To isolate x , divide each side by 6: $60 \div 6 = 6x \div 6$, or $10 = x$.
5. A. A fixed, simple pulley gives no mechanical advantage, so its mechanical-advantage number is 1.
6. D. The formula to determine the mechanical advantage of an incline plane is Length of Ramp \div Height of Ramp = Weight of Object \div Effort.

$$8 \div 4 = 400 \div E$$

$$8/4 = 400/E$$

$$8E = 1,600$$

$$8E/8 = 1,600/8$$

$$E = 200$$

7. B. Scientists agree that 33,000 foot-pounds per minute is one horsepower.
8. A. Power = Force/Area. $P = 130/1 = 130$.
9. D. Static electricity causes materials to "stick" together this way.
10. A. An aneroid barometer measures atmospheric pressure.
11. C. Meshed gears always turn in opposite directions.
12. D. Springs are used for all the listed purposes except to add weight.
13. B. Specific gravity is a comparison between the weight of a liquid and the weight of water. The liquid with the higher specific gravity will have a float that rises higher.

Sample Questions

Sample questions illustrating some of the types of questions found in the Mathematics Knowledge subtest follow. Explanatory answers are given at the end of this section and show how the correct answers are obtained.

1. The sum of $2\frac{5}{8}$, $3\frac{3}{16}$, $1\frac{1}{2}$, and $4\frac{1}{4}$ is

1-A $9\frac{13}{16}$

1-B $10\frac{7}{16}$

1-C $11\frac{9}{16}$

1-D $13\frac{3}{16}$

2. Which fraction is equal to 0.20?

2-A $\frac{1}{5}$

2-B $\frac{2}{7}$

2-C $\frac{3}{16}$

2-D $\frac{1}{50}$

3. Which of the following fractions is the least?

3-A $\frac{3}{4}$

3-B $\frac{5}{6}$

3-C $\frac{7}{8}$

3-D $\frac{19}{24}$

4. The product of $11\frac{2}{13}$ times $13\frac{7}{9}$ is most nearly
- 4-A 152.58
 - 4-B 152.68
 - 4-C 153.58
 - ✓4-D 153.68
5. The sum of $\sqrt{81}$ and $\sqrt{25}$ is
- 5-A 106
 - 5-B 86
 - 5-C 24
 - ✓5-D 14
6. Find the value of $(3\sqrt{2})^2$
- 6-A $9\sqrt{2}$
 - ✓6-B 18
 - 6-C 24
 - 6-D 36
7. $\sqrt[3]{216}$ is equal to
- ✓7-A 6
 - 7-B 12
 - 7-C 36
 - 7-D 72
8. The fourth root of 81 is
- 8-A 324
 - 8-B 27
 - 8-C 9
 - ✓8-D 3
9. The numerical value of $5!$ is
- 9-A 110
 - 9-B 115
 - ✓9-C 120
 - 9-D 125
10. The numerical value of $\frac{4!}{3!}$ is
- 10-A .75
 - 10-B 1.25
 - 10-C 1.33
 - ✓10-D 4

11. Which one of the following is a prime number?

11-A 9

11-B 11

11-C 15

11-D 21

12. The reciprocal of 4 is

12-A .25

12-B .40

12-C 1.25

12-D 1.40

13. 1,000 is equivalent to

13-A 10^2

13-B 10^3

13-C 10^4

13-D 10^5

14. $10^3 \times 10^4 =$

14-A 10^7

14-B 10^{12}

14-C 100^7

14-D 100^{12}

15. When +5 is added to -7, the sum is

15-A +2

15-B -2

15-C +12

15-D -12

16. Find the product of $(-5)(-4)(-3)$.

16-A +12

16-B -12

16-C +60

16-D -60

17. Solve the following: $\frac{5}{9}(41 + 40) - 40 =$

17-A 55

17-B 5

17-C 22.30

17-D 73.80

18. If you subtract -1 from $+1$, the result will be

18-A -2

18-B -1

18-C $+1$

18-D $+2$

19. If $a + 6 = 7$, then a is equal to

19-A 0

19-B $\frac{7}{6}$

19-C $+1$

19-D -1

20. If $4y = 12$, then $y =$

20-A $\frac{1}{4}$

20-B $\frac{1}{3}$

20-C 3

20-D 8

21. If 50% of $x = 66$, then $x =$

21-A 132

21-B 99

21-C 66

21-D 33

22. $8 \times 8 = 4^x$. Find x .

22-A 1

22-B 2

22-C 3

22-D 4

23. If $2^{n-3} = 32$, then n equals

23-A 5

23-B 6

23-C 7

23-D 8

24. What percent of a is b ?

24-A $\frac{b}{a}$

24-B $\frac{a}{b}$

✓ 24-C $\frac{100b}{a}$

24-D $\frac{100a}{b}$

25. Using the formula $A = P(1 + rt)$, find A when $P = 500$, $r = .03$, and $t = 15$.

25-A 625

✓ 25-B 725

25-C 795

25-D 800

26. If $a = 5b$, then $\frac{3}{5}a =$

26-A $\frac{5}{3}b$

26-B $\frac{3}{5}b$

✓ 26-C $3b$

26-D $\frac{b}{3}$

27. If you multiply $x + 3$ by $2x + 5$, what will be the coefficient of x ?

✓ 27-A 11

27-B 10

27-C 9

27-D 6

28. $\frac{x-2}{x^2-6x+8}$ can be simplified to

28-A $\frac{1}{x-4}$

28-B $\frac{1}{x-2}$

28-C $\frac{1}{x+4}$

28-D $\frac{1}{x+2}$

29. If $2x = 3y$ and $5x + y = 34$, $y =$

29-A 4

29-B 5

29-C 6

29-D 7

30. Solve for x : $x + y = a$

$$x - y = b$$

30-A $a + b$

30-B $a - b$

30-C $\frac{1}{2}(a + b)$

30-D $\frac{1}{2}(a - b)$

31. Solve for x : $\frac{x+1}{8} = \frac{28}{32}$

31-A 5

31-B 6

31-C 7

31-D 8

32. If $\frac{a}{b} \times \frac{b}{c} \times \frac{c}{d} \times \frac{d}{e} \times x = 1$, then x must be equal to

32-A $\frac{a}{e}$

✓ 32-B $\frac{e}{a}$

32-C $\frac{1}{a}$

32-D $\frac{1}{e}$

33. If $\frac{a}{b} = \frac{3}{4}$, then $12a =$

33-A $3b$

33-B $6b$

✓ 33-C $9b$

33-D $12b$

34. The average of two numbers is A . If one of the numbers is x , the other number is

34-A $\frac{A}{2} - x$

34-B $\frac{A+x}{2}$

34-C $A - x$

✓ 34-D $2A - x$

35. Two angles that are both congruent and supplementary are

35-A acute angles.

35-B obtuse angles.

✓ 35-C right angles.

35-D straight angles.

36. In one hour, the minute hand of a clock rotates through an angle of

36-A 45°

36-B 90°

36-C 180°

✓ 36-D 360°

37. At 6:00 a.m., the angle between the hands of the clock is

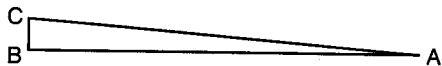
37-A 90°

37-B 120°

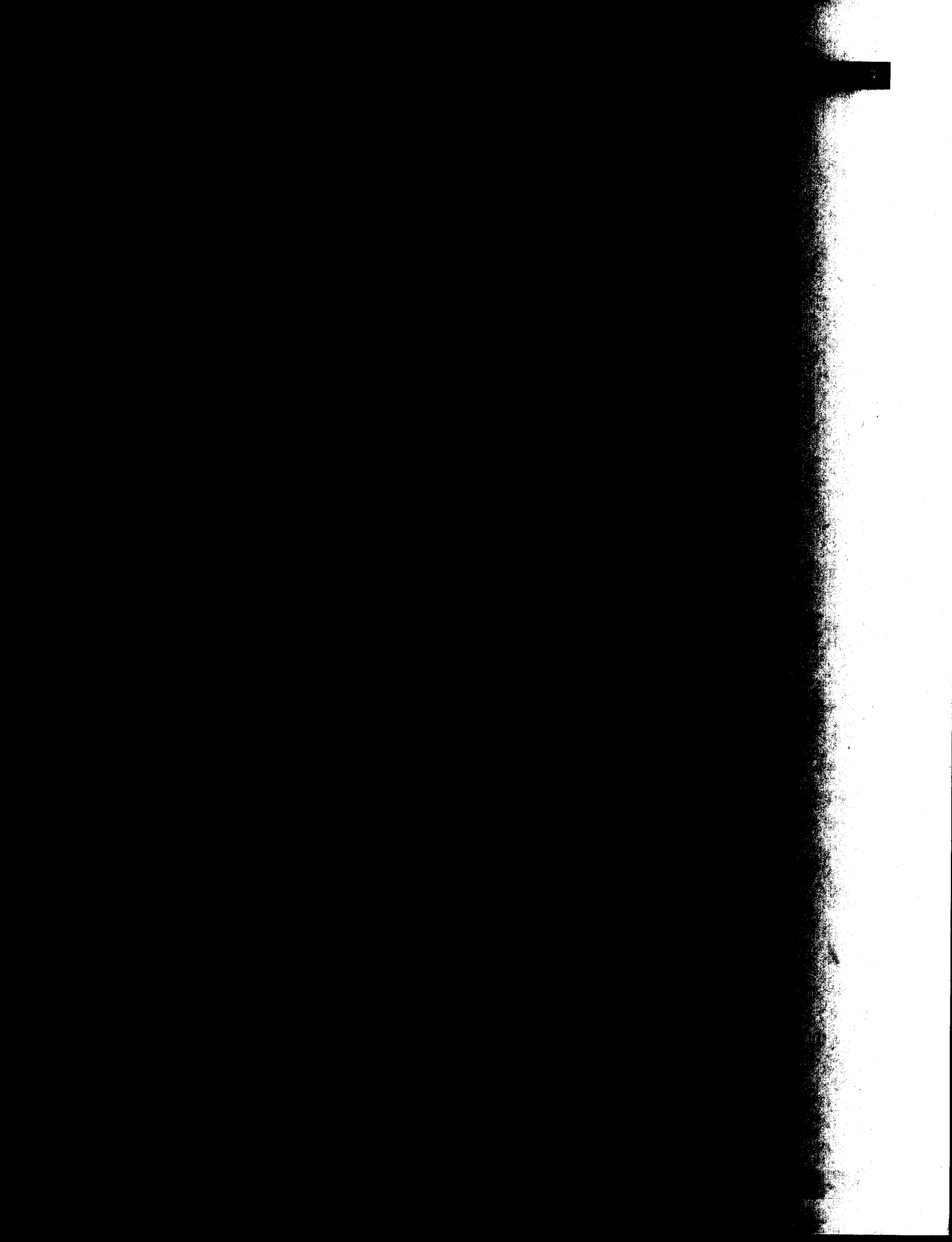
✓ 37-C 180°

37-D 360°

38. In the triangle given below, if $m\angle B = 90^\circ$,



- 38-A \overline{AB} is longer than \overline{AC} .
- 38-B $m\angle ABC$ is less than $m\angle ACB$.
- 38-C $m\angle ABC = m\angle ACB$.
- 38-D $m\angle ABC$ is greater than $m\angle ACB$.
39. A circle is inscribed in a square whose side is 6. What is the circumference of the circle in terms of π ?
- 39-A 3π
- 39-B 6π
- 39-C 9π
- 39-D 12π
40. The hypotenuse of a right triangle whose legs are 5" and 12" is
- 40-A 7"
- 40-B 13"
- 40-C 14"
- 40-D 17"
41. Approximately how many meters will a point on the rim of a wheel travel if the wheel makes 50 rotations and its radius is 1 meter?
- 41-A 314
- 41-B 298
- 41-C 283
- 41-D 157
42. The area of a square is 36 square inches. If the side of this square is doubled, the area of the new square will be
- 42-A 72 square inches.
- 42-B 144 square inches.
- 42-C 216 square inches.
- 42-D 244 square inches.
43. The circumference of a circle that has a radius of 70 feet is most nearly
- 43-A 440 feet.
- 43-B 660 feet.
- 43-C 690 feet.
- 43-D 15,300 feet.
44. The distance between two points on a graph whose rectangular coordinates are (2, 4) and (5, 8) is most nearly
- 44-A 5.0
- 44-B 5.5
- 44-C 6.0
- 44-D 6.5



12-A If the product of two numbers is 1, either number is called the reciprocal or multiplicative inverse of the other. For example, since $4 \times \frac{1}{4} = 1$, 4 is the reciprocal

of $\frac{1}{4}$ and $\frac{1}{4}$ is the reciprocal of 4. $\frac{1}{4}$ is equivalent to .25.

13-B $10 \times 10 \times 10 = 1,000$

14-A $10^3 = 1,000$; $10^4 = 10,000$; $1,000 \times 10,000 = 10,000,000$ or 10^7 . To multiply numbers of the same base, add the exponents. $10^3 \times 10^4 = 10^{(3+4)} = 10^7$.

15-B To add numbers with different signs, subtract the magnitude of the numbers and use the sign of the number with the greater magnitude.

16-D If there is an odd number of negative factors when multiplying, the product is negative. $(-5)(-4)(-3) = -60$.

17-B $\left(\frac{5}{9} \times 81\right) - 40 = 45 - 40 = 5$

18-D Subtracting -1 from $+1$, change -1 to $+1$ and add to $+1 = +2$.

19-C $a = 7 - 6 = +1$

20-C $y = \frac{12}{4} = 3$

21-A $\frac{1}{2}$ of $x = 66$; $x = 66 \times 2 = 132$

22-C $8 \times 8 = 64$; $4 \times 4 \times 4 = 64$; $x = 3$

23-D $2^5 = 32$; $n - 3 = 5$; $n = 8$

24-C $\frac{b}{a} \times 100 = \frac{100b}{a}$

25-B $A = 500(1 + .03 \times 15) = 500(1 + .45) = 500(1.45) = 725$

26-C $\frac{3}{5} \times 5b = 3b$

27-A $x + 3$

$2x + 5$

$2x^2 + 6x$

$+5x + 15$

$2x^2 + 11x + 15$

28-A The factors of $x^2 - 6x + 8$ are $(x - 4)$ and $(x - 2)$.

$$\text{Therefore, } \frac{x-2}{x^2-6x+8} = \frac{x-2}{(x-4)(x-2)} = \frac{1}{(x-4)}.$$

29-A Solve for x : $2x = 3y$ Substitute in the second equation and solve for y : $5\left(\frac{3y}{2}\right) + y = 34$

$$x = \frac{3y}{2}$$

$$\frac{15y}{2} + y = 34$$

$$15y + 2y = 68$$

$$17y = 68$$

$$y = 4$$

30-C Add the two equations to eliminate y :

$$x + y = a$$

$$x - y = b$$

$$\hline 2x = a + b$$

Solve for x :

$$x = \frac{a+b}{2}$$

31-B Solve for x :

$$\frac{x+1}{8} = \frac{28}{32}$$

$$(x+1)32 = 8 \times 28$$

$$32x + 32 = 224$$

$$32x = 224$$

$$32x = 192$$

$$x = \frac{192}{32} = 6$$

32-B Divide common factors, and then solve.

$$\frac{a}{\cancel{b}} \times \frac{\cancel{b}}{\cancel{c}} \times \frac{\cancel{c}}{\cancel{d}} \times \frac{\cancel{d}}{e} \times x = 1$$

$$\frac{a}{e} \times x = 1$$

$$\frac{ax}{e} = 1$$

$$ax = e$$

$$x = \frac{e}{a}$$

33-C Solve for a : $\frac{a}{b} = \frac{3}{4}$

$$4a = 3b$$

$$a = \frac{3b}{4}$$

$$12a = \cancel{12} \left(\frac{3b}{\cancel{4}} \right)$$

$$12a = 9b$$

34-D Let x = one of the numbers and y = the other number. $\frac{x+y}{2} = A$; $x+y = 2A$; $y = 2A - x$.

35-C If the angles are congruent and supplementary, they must be of the same measure and add up to 180° . Each measures 90° or a right angle.

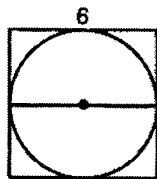
36-D In 1 hour, the minute hand rotates a full circle of 360° .

37-C At 6 a.m., one hand is at 6 and the other is at 12, forming a straight angle or 180° .

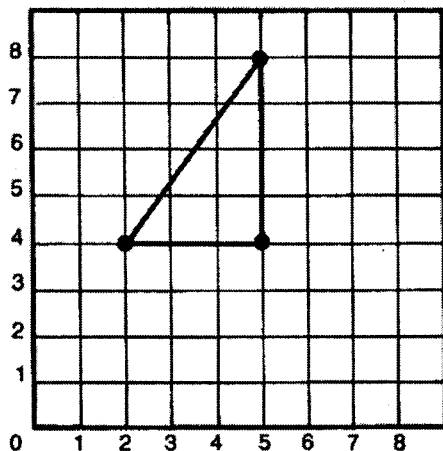


38-D In this right triangle, angle ABC is a right angle. Each of the measures of the other angles in the triangle must be less than 90° . \overline{AC} , the hypotenuse, is longer than either leg of the triangle.

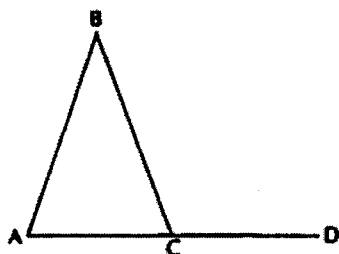
39-B Side = 6; therefore, diameter = 6. Circumference = $\pi \times$ diameter = 6π .



- 40-B** The Pythagorean theorem states that for any right triangle, the sum of the square of the legs is equal to the square of the length of the hypotenuse. $5^2 + 12^2 = h^2$, $25 + 144 = h^2$, $h^2 = 169$. $\sqrt{169} = 13$. $h = 13$. The correct answer is 13".
- 41-A** If the radius of the wheel is 1 meter, its diameter is 2 meters. The circumference is $\pi \times \text{diameter} = 2 \times 3.14$. The distance traveled is $50 \times 2 \times 3.14 = 100 \times 3.14 = 314$.
- 42-B** If the area of a square = 36 square inches, the side of the square = 6 inches. If doubled to 12 inches, the area of the new square will be 12 inches by 12 inches = 144 square inches.
- 43-A** If the radius is 70 feet, the diameter is 140 feet. Circumference = $\pi \times \text{diameter} = 140 \times \frac{22}{7} = 440$ feet.
- 44-A** As shown in the following graph, we have a right triangle with one leg of 3 and the other leg of 4. Using the Pythagorean theorem, the hypotenuse, or the distance between the two points, is obtained as follows: $h^2 = 3^2 + 4^2$; $h^2 = 9 + 16$; $h^2 = 25$; $h = \sqrt{25}$; $h = 5$.



45-B



ACD is a straight line. Therefore, if $m\angle BCD = 110^\circ$, $m\angle BCA = 70^\circ$. $AB = BC$. Therefore, triangle ABC is an isosceles triangle and $m\angle BAC = m\angle BCA = 70^\circ$. The sum of the measures of the angles of a triangle = 180° . Therefore, $m\angle ABC = 180^\circ - (70^\circ + 70^\circ) = 180^\circ - 140^\circ = 40^\circ$.