WorkKeys®

Applied Mathematics

Prep Package

ACT

Test Taking Tips

Although there are several different WorkKeys skill assessments, these practice materials focus on only a few of them. These practice tests contain multiple-choice items with a question followed by five possible answers from which you are to choose the ***best*** one. The following suggestions apply to all WorkKeys multiple-choice tests.

Pace yourself.

The time limits set for each WorkKeys test give nearly everyone enough time to finish all the questions. However, it is important to pace yourself. Don't spend too much time on one problem or reading section; go on to the other questions and come back if there is time.

Listen to and read the directions for each test carefully.

Before you begin taking one of the WorkKeys tests, pay careful attention to the directions. These tests ask for the ***best*** answer. It is important to keep this in mind when answering the questions, since it will sometimes be possible to think of responses that could be better than any of those offered or to defend a choice as not entirely wrong. Best-response formats are consistent with the real world, where choosing among less-than-perfect alternatives is routine.

You may want to work out the answer you feel is correct and look for it among the choices given. If your answer is not among the choices provided, reread the question and consider all of the answer choices again to find the best one.

Read each question carefully.

It is important that you understand what each question asks. Some questions will require you to go through several steps to find the best answer, while others can be answered more quickly.

Answer the easy questions first.

The best strategy for taking a test is to answer the easy questions and skip the questions you find difficult. After answering all of the easy questions, go back and try to answer the more difficult questions.

Use logic in more difficult questions.

When you return to the more difficult questions, try to use logic to eliminate incorrect answers to a question. Compare the answer choices to each other and note how they differ. Such differences may provide clues as to what the question requires. Eliminate as many incorrect answers as you can, then make an educated guess from the remaining answers.

Answer every question.

Your score on the WorkKeys tests will be based on the number of questions that you answer correctly; **there is no penalty for guessing.** Thus, you should answer every question within the time allowed for each test, even if you have to guess. You will be notified when there are five minutes remaining on each test.

Review your work.

If there is time left after you have answered every question on a test, go back and check your work on that test. Check to be sure that you marked only one answer to each question. You will not be allowed to go back to any other test or mark answers to a test after time has been called on that test.

Be precise in marking your answer document.

Be sure that you fill in the correct circles on your answer document. Check to be sure that the number for the line of circles on your answer document is the same as the number for the question you are answering. Position your answer document next to your test booklet so you can mark your answers quickly and completely.

Erase completely.

If you want to change an answer on your answer document, be sure to erase the unintended mark completely.

APPLIED MATHEMATICS

45 Minutes - 33 Questions

DIRECTIONS: There are 33 questions in this test, a small number of which are included for developmental purposes. Answers to these developmental questions will not count toward your score.

This test measures mathematics skills related to success in the workplace.

Each question in the test is numbered, and the five answer options are lettered. After calculating a solution, decide which answer is the best answer for each question. Next, find the row of ovals on the answer folder numbered the same as the question. Then, find the oval in that row lettered the same as your chosen answer. Finally, fill in the oval completely. Use a soft-lead pencil and make your marks heavy and dark.
DO NOT USE A PEN.

If you change your mind about an answer, erase your first oval thoroughly before filling in the new oval. For each question, make sure that you mark your answer in the row of ovals with the same number as the question.

On this test, you will not be penalized for guessing, so you should try to answer every question. Do not use too much time on any one question. If you do not know the correct answer, pick the one you think is best. Go back and check any questions you had difficulty with if you have time.

You should have a calculator and a WorkKeys formula sheet to use for this test. You may use them for any problems you choose. The formula sheet can be found at the beginning of this test booklet and may be torn out for easier use.

Note: Unless the problem indicates otherwise, you should assume all of the following.

1. Diagrams are not necessarily drawn to scale.
2. The word *line* indicates a straight line.
3. If a problem calls for pi (π), use the number 3.14 for that value. If you have a π key on your calculator and you use that key, your answers may not match any of the options given for the problem.
4. The word *average* indicates arithmetic mean. For example, the average of 2, 6, and 7 is calculated as follows: $(2 + 6 + 7) \div 3$.

To make sure that your calculator is working properly, please take the time to complete the following brief problems.

$9 \times 53 = ?$ (you should get 477)

$477 \div 15 = ?$ (you should get 31.8)

If you did not get the answers shown in parentheses, please tell the person who is administering the test.

The Answer Folder included is a sample; you can use it to simulate the testing environment and then score it yourself.

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO.

PRACTICE WORKKEYS® Answer Folder

ACT™
P.O. Box 168
Iowa City, IA 52243-0168

1 SITE NAME AND ADDRESS

School/Company

District/Institution

City State ZIP Code

2 NAME

Last Name | First Name | MI

(A–Z bubbles for each letter position)

DIRECTIONS: Your answer folder will be scored by a computer. To be sure that the computer sees the responses you intended:

- Use a soft lead No. 2 pencil. **Do not** use ink or ball-point pen.
- Fill in the appropriate ovals completely.
- Make marks heavy and dark and keep within the ovals.
- To change an answer, erase completely and then mark the new choice.

CORRECT MARK

INCORRECT MARK

3 SOCIAL SECURITY OR ID NUMBER

(0–9 bubbles for each digit)

4 DATE OF BIRTH

Month	Day	Year
Jan.		19
Feb.		
March	0 0	19 0 0
April	1 1	1 1
May	2 2	2 2
June	3 3	3 3
July	4	4 4
Aug.	5	5 5
Sept.	6	6 6
Oct.	7	7 7
Nov.	8	8 8
Dec.	9	9 9

5 GENDER

- Female
- Male

6 RACIAL OR ETHNIC GROUP

- African-American/Black, Non-Hispanic
- American Indian/Alaskan Native
- Asian-American or Pacific Islander
- Caucasian/White, Non-Hispanic
- Mexican-American/Chicano
- Puerto Rican
- Cuban
- Other Hispanic/Latino
- Other
- I prefer not to respond.

7 What is your current or highest level of education? (Mark ONE only.)

Secondary:
- 7th Grade
- 8th Grade
- 9th Grade
- 10th Grade
- 11th Grade
- 12th Grade
- H. S. Grad.
- GED
- Other

Postsecondary:
- 1st Year
- 2nd Year
- 3rd Year
- 4th Year
- 5th Year or Higher
- Other

Test Name: ____________________

TEST FORM	BOOKLET NUMBER	ADMIN. CODE
A 0 0 A A ... J 9 9 J J	0–9 (7 columns)	0–9 (3 columns)

1 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	16 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ	31 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
2 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ	17 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	32 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ
3 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	18 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ	33 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
4 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ	19 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	34 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ
5 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	20 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ	35 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
6 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ	21 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	36 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ
7 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	22 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ	37 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
8 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ	23 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	38 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ
9 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	24 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ	39 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
10 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ	25 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	40 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ
11 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	26 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ	41 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
12 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ	27 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	42 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ
13 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	28 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ	43 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
14 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ	29 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	44 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ
15 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	30 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ	45 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

WorkKeys®

Applied Mathematics Formula Sheet

Distance
1 foot = 12 inches
1 yard = 3 feet
1 mile = 5,280 feet
1 mile ≈ 1.61 kilometers
1 inch = 2.54 centimeters
1 foot = 0.3048 meters
1 meter = 1,000 millimeters
1 meter = 100 centimeters
1 kilometer = 1,000 meters
1 kilometer ≈ 0.62 miles

Area
1 square foot = 144 square inches
1 square yard = 9 square feet
1 acre = 43,560 square feet

Volume
1 cup = 8 fluid ounces
1 quart = 4 cups
1 gallon = 4 quarts
1 gallon = 231 cubic inches
1 liter ≈ 0.264 gallons
1 cubic foot = 1,728 cubic inches
1 cubic yard = 27 cubic feet
1 board foot = 1 inch by 12 inches by 12 inches

Weight/Mass
1 ounce ≈ 28.350 grams
1 pound = 16 ounces
1 pound ≈ 453.592 grams
1 milligram = 0.001 grams
1 kilogram = 1,000 grams
1 kilogram ≈ 2.2 pounds
1 ton = 2,000 pounds

Rectangle
perimeter = $2(length + width)$
area = $length \times width$

Rectangular Solid (Box)
volume = $length \times width \times height$

Cube
volume = $(length\ of\ side)^3$

Triangle
sum of angles = 180°
area = $\frac{1}{2}(base \times height)$

Circle
number of degrees in a circle = 360°
circumference ≈ $3.14 \times diameter$
area ≈ $3.14 \times (radius)^2$

Cylinder
volume ≈ $3.14 \times (radius)^2 \times height$

Cone
volume ≈ $\frac{3.14 \times (radius)^2 \times height}{3}$

Sphere (Ball)
volume ≈ $\frac{4}{3} \times 3.14 \times (radius)^3$

Electricity
1 kilowatt-hour = 1,000 watt-hours
amps = watts ÷ volts

Temperature
°C = 0.56 (°F − 32) or $\frac{5}{9}$(°F − 32)
°F = 1.8 (°C) + 32 or $(\frac{9}{5} \times$ °C) + 32

NOTE: Problems on the WorkKeys *Applied Mathematics* assessment should be worked using the formulas and conversions on this formula sheet.

ACT®

1. A grocer takes delivery of beverages from your truck at $6 per case. You unloaded 53 cases for the grocer today. How much does the grocer owe you?

   A. $ 9
   B. $ 47
   C. $ 59
   D. $318
   E. $653

2. To make curtains for a living room window for a customer, you will need three pieces of fabric in the following lengths: 3 feet, 3 feet, and 5 feet. What is the total length of fabric you will need?

   F. 8 feet
   G. 11 feet
   H. 14 feet
   J. 30 feet
   K. 45 feet

3. In your job as a cashier, a customer gives you a $20 bill to pay for a can of coffee that costs $3.84. How much change should you give back?

   A. $15.26
   B. $16.16
   C. $16.26
   D. $16.84
   E. $17.16

4. You sell pies at a farmers' market for $7.50 each. A group of 5 kids wants to pitch in equally to share one of your pies. How much will each of them need to pay to buy a whole pie together?

   F. $0.75
   G. $1.50
   H. $2.50
   J. $3.75
   K. $7.50

5. Your warehouse had 51 cases of Happy Cola at the start of your shift. A truck arrived this morning with another 25 cases of Happy Cola. How many cases of Happy Cola do you have now?

   A. 2
   B. 25
   C. 26
   D. 51
   E. 76

6. You work at a fruit market. Bananas cost 50¢ a pound. A customer hands you a bunch of bananas that weighs 3 pounds. How much should you charge for the bunch of bananas?

   F. $0.17
   G. $0.50
   H. $0.53
   J. $1.50
   K. $3.50

7. As a bowling instructor, you calculate your students' averages during tournaments. In 5 games, one bowler had the following scores: 143, 156, 172, 133, and 167. What was that bowler's average?

   A. 147
   B. 153
   C. 154
   D. 156
   E. 161

8. You need about $1\frac{1}{2}$ hours to set up a computer workstation.

   At this rate, how many hours should it take you to set up 7 of these workstations?

   F. $4\frac{2}{3}$

   G. $8\frac{1}{2}$

   H. 10

   J. $10\frac{1}{2}$

   K. $11\frac{2}{3}$

9. You are balancing the checking account for your new lawn-care business. Based on the check register below, how much money is in the account?

Check number	Date	Memo	Check amount	Deposit amount	Balance
	7/1	Deposit		$581.22	$.
101	7/3	Rake & axe	$27.91		$.
102	7/5	Van repair	$52.81		$.
103	7/5	New mower	$265.80		$.
104	7/6	Gas	$10.00		$.
	7/31	Deposit		$330.67	$.

   A. $330.67
   B. $356.52
   C. $555.37
   D. $581.22
   E. $911.89

10. The diaper service where you work bills customers once a week. Each week, it charges 30¢ each for the first 75 diapers used, and 25¢ each for any additional diapers. How much should you bill a family that used 100 diapers last week?

F. $18.75
G. $22.50
H. $25.00
J. $28.75
K. $30.00

11. For your job, you often fly between Seattle and Miami. The distance between these cities is 2,724 miles. You earn a free flight after you accumulate 25,000 miles of travel. How many round trips (back and forth) must you make between Seattle and Miami in order to earn a free flight?

A. 4
B. 5
C. 8
D. 9
E. 10

12. You are a receptionist at a doctor's office. A patient's bill for a checkup totals $85.00. The patient's health insurance requires the patient to pay 20% of the total bill. How much should the patient pay for the checkup?

F. $ 4.25
G. $ 8.50
H. $17.00
J. $42.50
K. $68.00

13. You are scheduling a new delivery route and you need to find out how long it will take a driver to complete the route. You start the route at 9:50 A.M. and finish at 2:05 P.M. How long does it take to drive the route?

    A. 4 hours 15 minutes
    B. 4 hours 55 minutes
    C. 5 hours 15 minutes
    D. 5 hours 45 minutes
    E. 7 hours 45 minutes

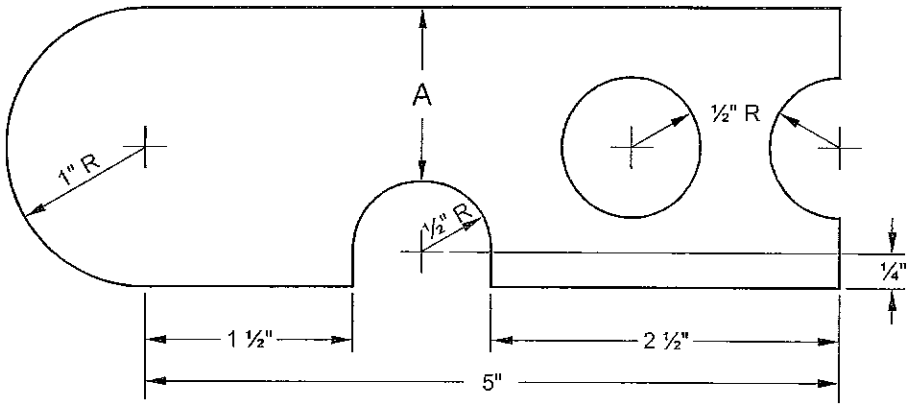
14. You are making a welding fixture and must cut down a length of steel tubing from $19\frac{3}{8}$ inches to $11\frac{9}{16}$ inches. When you cut the tubing, you will waste $\frac{1}{16}$ inch of it because of the width of the saw cut. If the leftover piece is long enough, you will use it in another fixture. How long will this leftover piece be?

    F. $7\frac{3}{4}$
    G. $7\frac{13}{16}$
    H. $7\frac{7}{8}$
    J. $8\frac{1}{4}$
    K. $8\frac{3}{4}$

15. A refrigeration system at your company uses temperature sensors fixed to read Celsius (°C) values, but the system operators in your control room understand only the Fahrenheit scale. You have been asked to make a Fahrenheit (°F) label for the high temperature alarm, which is set to ring whenever the system temperature rises above –10°C. What Fahrenheit value should you write on the label?

    A. –50°F
    B. –23°F
    C. –18°F
    D. 14°F
    E. 26°F

16. You check on manufactured parts in a factory. You need to take measurements to ensure quality. According to the drawing shown, what is the measurement of dimension A?



F. ¾"
G. 1"
H. 1¼"
J. 1½"
K. 1¾"

17. The price of a shampoo, cut, and style at the hairstyling salon where you work is $18.00. You generally get a 20% tip from each customer, and the salon owner pays you $\frac{1}{4}$ of each job's cost. On a typical day, you give shampoos, cuts, and styles to 8 customers. About how much can you expect to earn for yourself on such a day?

A. $ 48.96
B. $ 57.60
C. $ 64.80
D. $147.60
E. $208.80

18. As a laboratory assistant, you measure chemicals using the metric system. For your current research, you need to measure out 45 grams of sodium chloride. The bottle you are using lists the amount in ounces. About how many ounces of sodium chloride will you need?

F. 0.1
G. 1.6
H. 28.4
J. 720.0
K. 1,275.8

19. You are doing marketing research to find out the purchasing potential of students in the community. Based on the latest census, there are 9,860 students in a population of 62,400 people. What percent of the total population is students?

A. 6.3
B. 7.3
C. 15.8
D. 52.5
E. 84.2

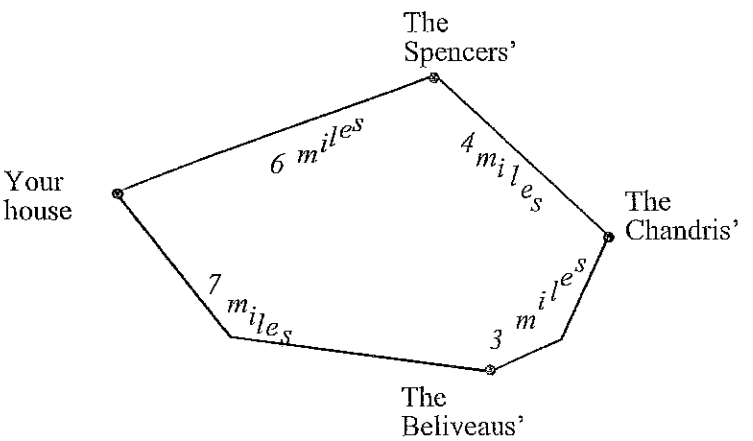
20. Your client has saved $1,860 for a down payment on a house. A government loan program requires a down payment equal to 3% of the loan amount. What is the largest loan amount that your client could receive with this program?

F. $ 5,580
G. $ 6,200
H. $55,800
J. $61,380
K. $62,000

21. At Appliance City you sold a refrigerator to a customer for $369.00. Appliance City advertises that if a customer finds the same refrigerator anywhere else for a lower price you will give them a refund equal to 150% of the price difference. A customer arrives with a Kitchen Stuff Inc. ad that shows the same refrigerator for $335.00. After giving the advertised refund to the customer, what is the customer's final cost?

A. $ 51.00
B. $219.00
C. $318.00
D. $335.00
E. $364.00

22. The map below shows the location of 3 houses where you had to do lawn work today. Your truck gets 8 miles per gallon of gasoline, so you chose the shortest route from your house to the jobs and then back home, as shown below. If gas costs $1.52 per gallon, what was the total cost of the gas that you used today?



F. $2.50
G. $3.42
H. $3.80
J. $6.20
K. $7.50

23. You need to haul a load of patio bricks to a job site. Each brick weighs 4 pounds 14 ounces. Your truck can carry a ¾-ton load. How many bricks can your truck carry in a full load?

A. 300
B. 307
C. 362
D. 409
E. 483

24. You are applying fertilizer to a football field. The field is 360 feet long and 160 feet wide. You use 8 pounds of fertilizer per 1,000 square feet. The fertilizer comes in 50-pound bags. How many bags of fertilizer will you need to complete the job?

F. 6
G. 7
H. 8
J. 9
K. 10

25. You are a school photographer taking individual and class pictures for 2 classes of 21 students each. On average, each individual picture takes 3 minutes and a class picture takes 10 minutes. About how long should it take you to get all of the pictures?

A. 1 hour 3 minutes
B. 1 hour 13 minutes
C. 2 hours 6 minutes
D. 2 hours 16 minutes
E. 2 hours 26 minutes

26. You need to put oil into the gearbox of a rebuilt machine tool. The gearbox holds 16.3 liters of oil but the only oil you have is in 1-quart containers. How many of the 1-quart containers of oil will you need to fill the gearbox with 16.3 liters of oil?

F. 1
G. 5
H. 17
J. 18
K. 62

27. At the metal-casting company where you work, you must set up a conveyor system to move castings from the furnace to the heat treatment area 55 yards away. The castings cool at the rate of 0.3°F (degrees Fahrenheit) per second and must not be allowed to cool more than 7°F before being heat treated. What is the minimum speed, in feet per second, that the conveyor must move?

A. 2.10
B. 2.36
C. 2.62
D. 4.86
E. 7.07

28. Five days a week, you carpool with 3 co-workers and take turns driving each week. It is 14 miles from your home to your office. When you drive the carpool you must go an extra 4 miles to pick up your co-workers. If your car averages 18 miles per gallon, about how many gallons of gas should you save every 4 weeks by carpooling?

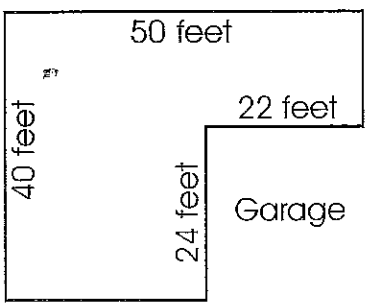
F. 4.2
G. 8.9
H. 10.1
J. 21.1
K. 31.1

29. You just finished paving a rectangular driveway measuring 75 feet by 20 feet. You charged the customer $1,000. After deducting the expenses shown below, how much profit did your company make on this job?

Item/ Expense	Unit Cost	Quantity	Total Expense
gravel	$15 per cubic yard	12 ½ cubic yards	$
tar/sealant	15¢ per square foot	75 ft by 20 ft	$
labor	$10 per hour	25 hours	$
insurance	Not applicable	Not applicable	$45.00

A. $292.50
B. $300.00
C. $337.50
D. $517.35
E. $707.50

30. You need to pump water out of a flooded basement, using two 50-gallon-per-minute (gpm) pumps. The basement has the dimensions shown and is flooded to a depth of 16 inches. How long will it take to pump the water out of the basement?



F. 18 minutes
G. 1 hour 47 minutes
H. 2 hours 27 minutes
J. 3 hours 19 minutes
K. 4 hours 54 minutes

DO YOUR FIGURING HERE.

31. To complete bookshelves, a customer at your store needs to purchase vertical brackets to attach to the wall. The customer wants the shelving to be 9 feet high and 10 feet long. The wall brackets come in 48-inch and 60-inch sections. The 48-inch sections cost $12.95; the 60-inch sections cost $16.95. The brackets should be 1 foot from each end and no more than 24 inches apart. What will be the total cost of the brackets, before tax?

A. $ 89.70
B. $119.60
C. $129.50
D. $149.50
E. $179.40

32. You have to order fencing for a 25-acre, rectangular field. One side of the field measures exactly $\frac{1}{4}$ mile. How many yards of fencing will you need to enclose the field completely?

F. 1,320
G. 1,430
H. 4,290
J. 363,000
K. 1,089,000

33. You are an urban planner assessing the growth of a city. Ten years ago, the city's population was 249,583. Its current population is 318,270. By about what percentage has the city grown over the past ten years?

A. 13%
B. 22%
C. 28%
D. 69%
E. 78%

STOP! END OF TEST.
YOU MAY GO BACK AND CHECK YOUR WORK.

Answer Key is provided on next page.

Keysheet
Applied Mathematics Practice Test

Number	Key
1	D
2	G
3	B
4	G
5	E
6	J
7	C
8	J
9	C
10	J
11	B
12	H
13	A
14	F
15	D
16	H
17	C
18	G
19	C
20	K
21	C
22	H
23	B
24	K
25	E
26	J
27	E
28	J
29	A
30	H
31	D
32	G
33	C

WorkKeys ***Applied Mathematics*** Level Estimates

NOTE: These items are mapped to WorkKeys levels and can give an indication of skills levels likely to be achieved on actual WorkKeys assessments. However, remember that these are practice materials only, have not been psychometrically calibrated, and are **NOT** substitutes for official WorkKeys tests and scores. They are intended to be used for developmental/training purposes only.

Number of Items Correct	Estimated Level Score
0-12	<3
13-16	3
17-21	4
22-25	5
26-28	6
29+	7

Answer Justifications

1. Multiply the cost per case by the number of cases.

A. Incorrect: 53 ÷ 6 = 8.83, rounded up to 9 (divided instead of multiplying)
B. Incorrect: 53 – 6 = 47 (subtracted instead of multiplying)
C. Incorrect: 6 + 53 = 59 (added instead of multiplying)
D. **Correct:** $6/case × 53 cases = $318 owed
E. Incorrect: 6, 53→ 653 (simply combined numbers)

2. Add the individual curtain lengths to get the total length needed.

F. Incorrect: 3 + 5 = 8 (only added two of the three lengths)
G. **Correct:** 3 feet + 3 feet + 5 feet = 11 feet
H. Incorrect: (3 × 3) + 5 = 14 (multiplied the first two lengths instead of adding, then added the third length)
J. Incorrect: (3 + 3) × 5 = 30 (added the first two lengths but then multiplied by the third length instead of adding)
K. Incorrect: (3 × 3) × 5 = 45 (used multiplication instead of addition)

3. Subtract the cost of the coffee from the amount given to the cashier to find the amount of change to be given to the customer.

A. Incorrect: $20.00 – $3.84 → $15.26 (did not borrow in the first decimal position but borrowed twice in the dollar position)
B. **Correct:** $20.00 – $3.84 = $16.16
C. Incorrect: $20.00 – $3.84 → $16.26 (did not borrow in the first decimal position)
D. Incorrect: $20.00 – $3.84 → $16.84 (subtracted dollars correctly but subtracted first numbers from second numbers in the cents positions)
E. Incorrect: $20.00 – $3.84 → $17.16 (did not borrow in the dollar position)

4. Divide the cost per pie by the number of kids sharing one pie.

F. Incorrect: 7.50 ÷ 10 or 7.50 with decimal place changed = 0.75 (divided by 10 instead of 5 or simply changed the decimal place of the cost of the whole pie)
G. **Correct:** $7.50 per pie ÷ 5 kids per pie = $1.50 per kid
H. Incorrect: 7.50 – 5 or 7.50 ÷ 3 = 2.50 (subtracted 5 from the cost of a whole pie instead of dividing by 5 or divided by 3 instead of 5)
J. Incorrect: 7.50 ÷ 2 = 3.75 or 7.50 × 5 = 37.50 → 3.75 (divided by 2 instead of 5 or multiplied by 5 instead of dividing and shifted decimal)
K. Incorrect: 7.50 ÷ 1 = 7.50 (total amount needed to buy a whole pie)

5. Add the number of cases of cola that arrived by truck to the number of cases already in the warehouse.

A. Incorrect: 51 ÷ 25 = 2.04, rounded down to 2 (divided instead of adding)
B. Incorrect: 25 (the number of cases that arrived by truck)
C. Incorrect: 51 – 25 = 26 (subtracted instead of adding)
D. Incorrect: 51 (the number of cases originally in the warehouse)
E. **Correct:** 51 cases + 25 cases = 76 cases

6. Multiply the cost of bananas per pound by the number of pounds in the bunch, then change cents to dollars.

F. Incorrect: $50¢ \div 3 = 16.67¢$, rounded up to \$0.17 (used division instead of multiplication)
G. Incorrect: $50¢ \times 1 =$ \$0.50 (cost of 1 pound of bananas, not 3)
H. Incorrect: $50¢ + 3 =$ \$0.53 (used addition instead of multiplication)
J. **Correct:** $50¢$ per pound $\times$ 3 pounds $= 150¢ =$ \$1.50
K. Incorrect: 3 pounds, $50¢ \rightarrow$ \$3.50 (just put numbers from the problem together without doing the math)

7. Find the total of the five scores, then divide the total by 5.

A. Incorrect: $(133 \times 172) \div 156 = 146.6$, rounded up to 147 (multiplied the low score by the high score, then divided by the median score)
B. Incorrect: $(133 + 172) \div 2 = 152.5$, rounded up to 153 (added the low and high scores, then divided by 2)
C. **Correct:** $(143 + 156 + 172 + 133 + 167) = 771$; $771 \div 5 = 154.2$, rounded down to 154
D. Incorrect: 156 is the median of the 5 scores (2 numbers below it, 2 numbers above it)
E. Incorrect: $(143 + 172 + 167) \div 3 = 160.7$, rounded up to 161 (added the first, third, and fifth scores, then divided by 3)

8. First, convert $1\frac{1}{2}$ to 1.5 and multiply this by the number of workstations. Next, recognize that the answers are in fraction form and equate 10.5 with $10\frac{1}{2}$.

F. Incorrect: $1\frac{1}{2} \rightarrow 1.5$; $7 \div 1.5 = 4.67$; $4.67 \rightarrow 4\frac{2}{3}$ (divided the number of workstations to be set up by the time needed to set up one workstation instead of multiplying)
G. Incorrect: $1\frac{1}{2} \rightarrow 1.5$; $7 + 1.5 = 8.5$; $8.5 \rightarrow 8\frac{1}{2}$ (added instead of multiplying)
H. Incorrect: $1\frac{1}{2} \rightarrow \frac{3}{2}$; $7 + 3 = 10$ (changed the mixed number to a fraction, then added only the numerator to the number of workstations to be set up)
J. **Correct:** $1\frac{1}{2} \rightarrow 1.5$; $7 \times 1.5 = 10.5$; $10.5 \rightarrow 10\frac{1}{2}$
K. Incorrect: $1\frac{1}{2} \rightarrow \frac{3}{2}$; $\frac{2}{3} \times 7 = 4\frac{2}{3}$; $7 + 4\frac{2}{3} = 11\frac{2}{3}$ (changed the mixed number to a fraction, inverted the fraction, and multiplied by the number of workstations to be set up, then added that result to the number of workstations)

9. Subtract each check amount from the first deposit, then add the last deposit.

A. Incorrect: \$330.67 (last deposit into the account)
B. Incorrect: $27.91 + 52.81 + 265.80 + 10.00 =$ \$356.52 (total amount of checks)
C. **Correct:** $581.22 - 27.91 - 52.81 - 265.80 - 10.00 + 330.67 =$ \$555.37
D. Incorrect: \$581.22 (first deposit into the account)
E. Incorrect: $581.22 + 330.67 =$ \$911.89 (total amount of deposits)

10. Convert the rates in cents to decimal dollars. Multiply the first 75 diapers by the first rate, determine the number over 75 by subtracting, then multiply that number by the second rate. Add the two amounts to get the total.

F. Incorrect: $75 \times 0.25 = 18.75$ (calculated for the first 75 diapers only and at the wrong rate)
G. Incorrect: $75 \times 0.30 = 22.50$ (calculated for the first 75 diapers only)
H. Incorrect: $100 \times 0.25 = 25.00$ (calculated all 100 diapers at the second rate)
J. **Correct:** $75 \times \$0.30 = \$22.50$; [$100 - 75 = 25$; $25 \times \$0.25 = \$6.25$]; $\$22.50 + \$6.25 = \$28.75$
K. Incorrect: $100 \times 0.30 = 30.00$ (calculated all 100 diapers at the first rate)

11. Double the distance to get the round-trip distance. Divide the accumulated miles needed by the round-trip distance for each trip. Round any decimal portion up to the next higher whole number.

A. Incorrect: 25,000 ÷ 5,448 = 4.59, rounded down to 4 (rounding down will not produce sufficient mileage for a free flight; it is the most round trips that can be taken without earning a flight)
B. **Correct:** 2 × 2,724 miles = 5,448 miles/trip; 25,000 miles needed ÷ 5,448 miles/trip = 4.59 trips needed, rounded up to 5
C. Incorrect: 25,000 ÷ 5,448 = 4.59, rounded down to 4; 4 × 2 = 8 (rounded down and doubled the number an extra time)
D. Incorrect: 25,000 ÷ 2,724 = 9.18, rounded down to 9 (used the number of one-way instead of round-trip flights and rounded down)
E. Incorrect: 25,000 ÷ 2,724 = 9.18, rounded up to 10 (used the number of one-way instead of round-trip flights and rounded up)

12. Multiply the total bill times the decimal equivalent of the patient's percentage.

F. Incorrect: 85 ÷ 20 = 4.25 (divided the total bill by 20 instead of multiplying by 0.20)
G. Incorrect: 85 ÷ 10 or × 0.10 = 8.50 (divided the total bill by 10 or multiplied by 0.10 instead of multiplying by 0.20)
H. **Correct:** $85 × 0.20 = $17.00
J. Incorrect: 85 ÷ 2 = 42.50 (divided the total bill by 2 instead of multiplying by 0.20)
K. Incorrect: 85 × 0.80 = 68 (calculated the insurance company's portion instead of the patient's portion)

13. Adjust the times to the 24-hour clock. Subtract the starting time from the ending time by "borrowing" 60 minutes from one hour.

A. **Correct:** 2:05 P.M. = 14:05; 14 hours 5 minutes – 9 hours 50 minutes = 13 hours 65 minutes – 9 hours 50 minutes = 4 hours 15 minutes
B. Incorrect: 2:05 P.M. – 9:50 A.M. = 14 hours 5 minutes – 9 hours 50 minutes = 13 hours 105 minutes – 9 hours 50 minutes = 4 hours 55 minutes (borrowed one hour but added 100 minutes instead of 60)
C. Incorrect: 2:05 P.M. – 9:50 A.M. = 14 hours 5 minutes – 9 hours 50 minutes = 14 hours 65 minutes – 9 hours 50 minutes = 5 hours 15 minutes (added 60 minutes but forgot to subtract one hour)
D. Incorrect: 2:05 P.M. – 9:50 A.M. = 14 hours 5 minutes – 9 hours 50 minutes = 5 (14-9) hours 45 (50-5) minutes (subtracted the minutes the wrong way)
E. Incorrect: 9:50 – 2:05 = 9 hours 50 minutes – 2 hours 5 minutes = 7 hours 45 minutes (ignored the A.M. and P.M. and subtracted the times given the wrong way)

14. Convert the fractions to lowest common denominator, then subtract the new length and the width of the saw cut from the original length.

F. **Correct:** $19\frac{3}{8} - 11\frac{9}{16} - \frac{1}{16} = 19\frac{6}{16} - 11\frac{9}{16} - \frac{1}{16} = 18\frac{22}{16} - 11\frac{9}{16} - \frac{1}{16} = 7\frac{12}{16} = 7\frac{3}{4}$
G. Incorrect: $19\frac{3}{8} - 11\frac{9}{16} = 7\frac{13}{16}$ (didn't account for the saw cut width)
H. Incorrect: $19\frac{3}{8} - (11\frac{9}{16} - \frac{1}{16}) = 7\frac{7}{8}$ (subtracted the saw cut from the piece cut instead of the total length)
J. Incorrect: $(19 - 11) + (\frac{9}{16} + \frac{1}{16} - \frac{3}{8}) = (19 - 11) + (\frac{10}{16} - \frac{3}{8}) = 8\frac{1}{4}$ (subtracted fractions in the wrong order)
K. Incorrect: $(19 - 11) + \frac{9-3}{16-8} = 8\frac{3}{4}$ (subtracted incorrectly in both the numerator and the denominator and didn't account for waste)

15. From the formula sheet, use the formula °F = (9/5 × °C) + 32.

A. Incorrect: (9/5 × –10) – 32 = –50 (subtracted 32 instead of adding 32)
B. Incorrect: 5/9 × (–10 – 32) = –23.33, rounded down to –23 (used Fahrenheit to Celsius conversion)
C. Incorrect: 9/5 × –10 = –18 (did not add 32)
D. **Correct:** (9/5 × –10) + 32 = 14°F
E. Incorrect: (5/9 × –10) + 32 = 26.44, rounded down to 26 (used 5/9 instead of 9/5)

16. Determine the width of the part by doubling the radius of the round end. Subtract the radius of the lower notch and the depth from the edge to the center of that circular notch from the total width of the part.

F. Incorrect: ½ + ¼ = ¾ (calculated the depth of the lower notch)
G. Incorrect: 2 – 1 = 1 (incorrectly identified the depth of the lower notch as 1" from the radius given)
H. **Correct:** (2 × 1") – (¼" + ½") = 2" – ¾" = 1¼"
J. Incorrect: 2 – ½ = 1½ (left out the distance between the edge of the piece and the center of the circular notch)
K. Incorrect: 2 – ¼ = 1¾ (left out the radius of the circular part of the lower notch)

17. Convert the percentage tip and the fraction of the job's price to decimals and add them to get your share of the income expressed as a decimal. Multiply the price paid per customer by the number of customers to get the total income. Multiply the total income by the decimal representing your share.

A. Incorrect: (0.20 + 0.14) × 18 × 8 = 48.96 (used 0.14 for $\frac{1}{4}$)
B. Incorrect: (0.20 + 0.20) × 18 × 8 = 57.60 (used 0.20 for $\frac{1}{4}$)
C. **Correct:** 20% = 0.20; $\frac{1}{4}$ = 0.25; 0.20 + 0.25 = 0.45; $18/customer × 8 customers = $144; $144 × 0.45 = $64.80
D. Incorrect: (18 + 0.45) × 8 = 147.60 (added the decimal equivalents to the cost of one customer, then multiplied by the number of customers)
E. Incorrect: [18 + (0.45 × $18)] × 8 = 208.80 (incorrectly added the cost per customer to the cost per customer with tip and your share of the income, then multiplied by the number of customers)

18. Divide the number of grams needed by the conversion factor for grams to ounces.

F. Incorrect: 45 ÷ 453.592 = 0.0992, rounded up to 0.1 (divided by number of grams/pound instead of number of grams/ounce)
G. **Correct:** 45 grams ÷ 28.350 grams/ounce = 1.5873, rounded up to 1.6 ounces
H. Incorrect: 28.350, rounded up to 28.4 (this is the approximate number of grams in an ounce, as shown on the formula sheet)
J. Incorrect: 45 × 16 = 720 (multiplied by number of ounces/pound instead of dividing by number of grams/ounce)
K. Incorrect: 45 × 28.350 = 1,275.75, rounded up to 1,275.8 (multiplied by number of grams/ounce instead of dividing)

19. Divide the number of students by the total number of people, then multiply by 100 to give a percent.

A. Incorrect: 62,400 ÷ 9,860 = 6.3 (divided the wrong way and did not change to a percent)
B. Incorrect: (62,400 + 9,860) ÷ 9,860 = 7.3 (added students to the total population then divided by the number of students)
C. **Correct:** 9,860 ÷ 62,400 × 100% = 15.8%
D. Incorrect: 62,400 – 9,860 ÷ 1,000 = 52.5 (subtracted the number of students from the total number of people, then divided by 1,000 to make the answer seem reasonable)
E. Incorrect: (62,400 – 9,860) ÷ 62,400 × 100 = 84.2% (found the percentage of non-students)

20. Change the percent given to a decimal, then divide the down payment available by the decimal to give the total loan amount.

F. Incorrect: $1{,}860 \times 3 = \$5{,}580$ (multiplied instead of dividing, and used percent instead of a decimal)
G. Incorrect: $1{,}860 \div 0.3 = \$6{,}200$ (incorrectly changed percent to a decimal)
H. Incorrect: $1{,}860 \times 30 = \$55{,}800$ (multiplied instead of dividing by a percent incorrectly changed to a decimal)
J. Incorrect: $\frac{1}{0.03} = 33$; $1{,}860 \times 33 = \$61{,}380$ (multiplied by the inverse of the decimal equivalent of the fraction but rounded off to only two digits when at least 4 should have been used since 1,860 has 4 digits)
K. **Correct:** $3\% = 0.03$; $\$1{,}860 \div 0.03 = \$62{,}000$

21. Subtract the lesser price from what they paid in order to find the difference. Multiply the difference by 150%, then subtract this refund amount from what was originally paid to find the net final cost of the refrigerator.

A. Incorrect: $(369 - 335) \times 150\% = 51.00$ (found the refund amount instead of the net final cost)
B. Incorrect: $369 - 150 = 219.00$ (subtracted the percent from the amount paid)
C. **Correct:** $\$369 - \$335 = \$34$; $\$34 \times 150\% = \$51$; $\$369 - \$51 = \$318.00$
D. Incorrect: $369 - (369 - 335) = 335.00$ (simply subtracted the difference in price instead of using the percent given)
E. Incorrect: $369 - [(369 - 335) \times 15\%] = 363.9$, rounded up to 364.00 (used 15% instead of 150%)

22. First, calculate the total number of miles driven, divide this number by the gas mileage of the truck, then multiply this number by the cost per gallon.

F. Incorrect: $6 + 4 + 3 + 7 = 20$; $20 \div 8 = 2.50$ (found the number of gallons needed, not the cost)
G. Incorrect: $8 + 3 + 3 + 4 = 18$; 18 miles $\div 8 \times 1.52 = 3.42$ (added the number of houses that need lawn work and miles per gallon in place of two of the distances given)
H. **Correct:** $(6 + 4 + 3 + 7)$ miles = 20 miles; 20 miles ÷ 8 miles/gallon = 2.5 gallons; 2.5 gallons × \$1.52/gallon = \$3.80
J. Incorrect: $8 \times 1.52 = 12.16$, rounded to 12.2; $12.2 + 7 - (6 + 3 + 4) = 6.20$ (multiplied miles per gallon times cost per gallon and rounded the answer to the nearest tenth, then added one number of miles and subtracted the sum of the other 3)
K. Incorrect: $(6 + 4 + 3 + 7) \times 3 \div 8 = 7.50$ (multiplied the sum of the miles driven by the number of houses stopped at, then divided by the miles per gallon)

23. Change the brick's weight in pounds and ounces to pounds. Determine the capacity of the truck in pounds, then divide the capacity of the truck by the weight of each brick to determine the number of bricks that would not exceed the capacity of the truck.

A. Incorrect: $3/4 \times 2{,}000 = 1{,}500$; $1{,}500 \div 5 = 300$ (rounded weight of one brick to nearest pound)
B. **Correct:** 4 pounds + (14 ounces ÷ 16 ounces/pound) = 4.875 pounds; ¾ ton × 2,000 pounds/ton = 1,500 pounds; 1,500 pounds ÷ 4.875 pounds/brick = 307.7 bricks, rounded down to 307 bricks
C. Incorrect: $3/4 \times 2{,}000 = 1{,}500$; $1{,}500 \div 4.14 = 362.32$, rounded down to 362 (converted 14 ounces to 0.14 pounds)
D. Incorrect: $4 + (14 \div 16) = 4.875$, rounded up to 4.88; $2{,}000 \div 4.88 = 409.84$, rounded down to 409 (used one ton as the capacity of the truck)
E. Incorrect: $2{,}000 \div 4.14 = 483.09$, rounded down to 483 (used one ton as the capacity of the truck, and converted 14 ounces to 0.14 pounds)

24. Calculate the area of the field, determine the weight of fertilizer needed, then calculate the number of bags needed, rounding any partial bag up to the nearest whole number to ensure complete coverage of the field.

F. Incorrect: $360 \div 160 \times 1{,}000 \div 8 \div 50 = 5.6$, rounded up to 6 (divided dimensions of the field instead of multiplying, multiplied instead of dividing by 1,000, and divided instead of multiplying by 8)
G. Incorrect: $360 \times 160 \div 8 \div 1{,}000 = 7.2$, rounded down to 7 (divided area of field by weight of the fertilizer per area instead of multiplying and did not consider the weight of one bag)
H. Incorrect: $360 \times 160 \div 1{,}000 - 50 = 7.6$, rounded up to 8, or just used 8 from the problem (did not consider the weight of fertilizer per area and subtracted 50 instead of dividing, or just chose 8 because it appears in the problem)
J. Incorrect: $(360 \times 160) \times 8 \div 1{,}000 \div 50 = 9.2$, rounded down to 9 (correctly worked the problem but rounded down instead of rounding up, leaving some of the field without fertilizer)
K. **Correct:** 360 feet × 160 feet × 8 pounds/1,000 square feet × 1 bag/50 pounds = 9.2 bags needed, rounded up to 10

25. Calculate the time needed for all the individual pictures, then add the time needed to take the class pictures. Convert total minutes to hours and minutes.

A. Incorrect: $21 \times 3 = 63$ = 1 hour 3 minutes (calculated the time needed to take individual pictures for one of the classes)
B. Incorrect: $(21 \times 3) + 10 = 73$ = 1 hour 13 minutes (calculated the time needed to take individual and class pictures for one of the classes)
C. Incorrect: $(21 \times 3) \times 2 = 126$ = 2 hours 6 minutes (calculated the time needed to take individual pictures for the 2 classes)
D. Incorrect: $(21 \times 3) \times 2 + 10 = 136$ = 2 hours 16 minutes (calculated the time needed to take individual pictures for the 2 classes but just 1 class picture)
E. **Correct:** (21 students/class × 3 minutes/student) × 2 classes + (2 classes × 10 minutes/class picture) = 146 minutes = 2 hours 26 minutes

26. Convert liters to gallons, then gallons to quarts. Round the answer up to the next higher whole number of quarts to ensure there is enough oil to fill the gearbox.

F. Incorrect: $16.3 \times 0.264 \div 4 = 1.08$, rounded down to 1 (divided by the quart/gallon factor instead of multiplying)
G. Incorrect: $16.3 \times 0.264 = 4.30$ or $16.3 \div 4 = 4.08$, rounded up to 5 (missed the gallons to quarts step of the conversion or missed the liters to gallons conversion and divided by the quart/gallon factor instead of multiplying)
H. Incorrect: $16.3 \times 0.264 \times 4 = 17.2$, rounded down to 17 (rounding down will leave the gearbox not full)
J. **Correct:** 16.3 liters × 0.264 gallons/liter × 4 quarts/gallon = 17.2 quarts, rounded up to 18
K. Incorrect: $16.3 \div 0.264 = 61.7$, rounded up to 62 (divided instead of multiplying and did not use the quarts/gallon factor)

27. Convert distance in yards to feet, calculate the maximum time before cooling, and then divide distance by time.

A. Incorrect: $(7 \times 0.3) = 2.10$ (simply multiplied the two numbers given in the problem)
B. Incorrect: $55 \div (7 \div 0.3) = 2.36$ (did not convert yards to feet)
C. Incorrect: $55 \div (7 \times 3) = 2.62$ (did not convert yards to feet and multiplied, instead of dividing, the temperature change by the rate of temperature change, dropping the decimal point)
D. Incorrect: $(55 \div 7) - 3 = 4.86$ (did not convert yards to feet and subtracted, instead of dividing, the rate of temperature change, dropping the decimal point)
E. **Correct:** (55 yards × 3 feet/yard) ÷ (7 degrees ÷ 0.3 degrees/second) = 7.07 feet/second

28. Calculate the total number of miles driven alone in 4 weeks and the amount of gasoline used. Calculate the total number of miles driven in the one week you drive if you carpool and the amount of gasoline used. Subtract the amount of gasoline used if you carpool from the amount of gasoline used if you drive alone.

F. Incorrect: $(14 \times 2 \times 4) - (18 \times 2 \times 1) = 76$; $76 \div 18 = 4.2$ (did not include 5 days/week in calculations)
G. Incorrect: $18 \times 2 \times 5 \times 4 \div 18 = 40$; $14 \times 2 \times 5 \times 4 \div 18 = 31.1$; $40 - 31.1 = 8.9$ (calculated 4 weeks of driving when carpooling instead of 1 out of each 4 weeks)
H. Incorrect: $18 \times 2 \times 5 = 180$; $180 \div 18 = 10$ (gallons of gas used carpooling)
J. **Correct:** 14 miles/trip × 2 trips/day × 5 days/week × 4 weeks = 560 miles; 560 miles ÷ 18 miles/gallon = 31.1 gallons; 18 miles/trip × 2 trips/day × 5 days/week × 1 week = 180 miles; 180 miles ÷ 18 miles/gallon = 10 gallons; 31.1 gallons – 10 gallons = 21.1 gallons
K. Incorrect: $14 \times 2 \times 5 \times 4 = 560$; $560 \div 18 = 31.1$ (gallons of gas used driving alone)

29. Calculate the cost of gravel using unit cost and quantity. Calculate the area for tar/sealant, then calculate the cost using the area and the cost per area. Calculate the labor cost using the number of hours and pay per hour. Subtract the total cost of all item/expenses from the amount charged.

A. **Correct:** 12½ cubic yards × \$15/cubic yard = \$187.50; 75 feet × 20 feet = 1,500 square feet; 1,500 square feet × 15¢ = \$225; 25 hours × \$10/hour = \$250; \$1,000.00 – (\$187.50 + \$225.00 + \$250.00 + \$45.00) = \$292.50
B. Incorrect: 300 (quick estimate of the answer)
C. Incorrect: $12\frac{1}{2} \times 15 = 187.50$; $1{,}500 \times 15¢ = 225$; $25 \times 10 = 250$; $187.50 + 225 + 250 = 662.50$; $1{,}000 - 662.50 = 337.50$ (forgot the insurance)
D. Incorrect: $12\frac{1}{2} \times 15 = 187.50$; added only 15¢ for tar/sealant; $25 \times 10 = 250$; $187.50 + 15¢ + 250 + 45 = 482.65$; $1{,}000 - 482.5 = 517.35$
E. Incorrect: $12\frac{1}{2} \times 15 = 187.50$; $1{,}500 \times 15¢ = 225$; $25 \times 10 = 250$; $187.50 + 225 + 250 + 45 = 707.50$ (total cost–did not subtract from amount charged)

30. From the dimensions given, determine the area of the basement floor. Using the water depth and the area of the floor, calculate the volume of the water and convert to gallons. From the volume of water and the rate of the pumps, calculate the time needed to pump the water.

F. Incorrect: $2 \times (50 + 40) = 180$; $180 \times 16 \div 12 = 240$; $240 \times 1{,}728 \div 231 \approx 1{,}795$; $1{,}795 \div 100 = 17.95 \approx 18$ (calculated using the perimeter, not the area, of the basement)
G. Incorrect: $50 \times 40 - (22 \times 24) = 1{,}472$; $1{,}472 \times (16 \div 12) \approx 1{,}962.7$; $1{,}962.7 \times 1{,}728 \div 231 \approx 14{,}682$; $14{,}682 \div 100 = 146.82 \approx 147$ (improperly converted 147 minutes to 1 hour 47 minutes
H. **Correct:** 50 feet × 40 feet – (22 feet × 24 feet) = 1,472 square feet; 1,472 square feet × (16 inches ÷12 inches/foot) ≈ 1,962.7 cubic feet; 1,962.7 cubic feet × 1,728 cubic inches/cubic feet ÷ 231 cubic inches/gallon ≈ 14,682 gallons; 14,682 gallons ÷ 100 gallons/minute = 146.82 minutes ≈ 147 minutes, or 2 hours 27 minutes
J. Incorrect: $50 \times 40 = 2{,}000$; $2{,}000 \times (16 \div 12) \approx 2{,}666.7$; $2{,}666.7 \times 1{,}728 \div 231 \approx 19{,}948$; $19{,}948 \div 100 = 199.48 \approx 199$ = 3 hours 19 minutes (included the garage space when calculating the area of the basement)
K. Incorrect: $50 \times 40 - (22 \times 24) = 1{,}472$; $1{,}472 \times (16 \div 12) \approx 1{,}962.7$; $1{,}962.7 \times 1{,}728 \div 231 \approx 14{,}682$; $14{,}682 \div 50 = 293.64$ minutes ≈ 294 minutes = 4 hours 54 minutes (failed to double the 50 gpm rate stated for having two pumps)

31. Determine which vertical brackets are needed based on the height of the bookshelves. Determine how many of each bracket are needed based on the length of the bookshelves. Calculate the total cost of the brackets.

A. Incorrect: 48 inches = 4 feet; 60 inches = 5 feet; 4 feet + 5 feet = 9 feet, the height needed; (12.95 + 16.95) × 3 = 89.70 (just figured cost of 3 sets of brackets when 5 are needed)
B. Incorrect: 48 inches = 4 feet; 60 inches = 5 feet; 4 feet + 5 feet = 9 feet, the height needed; (12.95 + 16.95) × 4 = 119.60 (just figured cost of 4 sets of brackets when 5 are needed)
C. Incorrect: 48 inches = 4 feet; 4 × 2.5 = 10 feet; 12.95 × 2.5 × 4 = 129.50 (figured cost for 2½ 48-inch sections (giving 10 feet instead of 9 feet) and 4 sets instead of 5)
D. **Correct:** 48 inches = 4 feet; 60 inches = 5 feet; 4 feet + 5 feet = 9 feet, the height needed; brackets are needed at the 1, 3, 5, 7 and 9-foot locations along the 10-foot shelves, thus 5 sets are needed; ($12.95 + $16.95) × 5 sets = $149.50
E. Incorrect: 48 inches = 4 feet; 60 inches = 5 feet; 4 feet + 5 feet = 9 feet, the height needed; (12.95 + 16.95) × 6 = 179.40 (figured cost of 6 sets of brackets when only 5 are needed)

32. Convert area from acres to square feet. Convert length of side from miles to feet. Find length of other side of field by dividing area by length of one side. Find the perimeter in feet, then convert to yards.

F. Incorrect: $\frac{1}{4} \times 5{,}280 = 1{,}320$ (converted miles to feet only)
G. **Correct:** 25 acres × 43,560 square feet/acre = 1,089,000 square feet; $\frac{1}{4}$ mile × 5,280 feet/mile = 1,320 feet; 1,089,000 square feet (area) ÷ 1,320 feet (length) = 825 feet (width); perimeter = (2 × 825 feet) + (2 × 1,320 feet) = 4,290 feet; 4,290 feet ÷ 3 feet/yard = 1,430 yards
H. Incorrect: 25 × 43,560 = 1,089,000; $\frac{1}{4} \times 5{,}280 = 1{,}320$; 1,089,000 ÷ 1,320 = 825; (2 × 825) + (2 × 1,320) = 4,290 (found the perimeter in feet but did not convert to yards)
J. Incorrect: 25 × 43,560 = 1,089,000 ÷ 3 = 363,000 (found the area in square feet, then erroneously converted the area instead of the perimeter to yards)
K. Incorrect: 25 × 43,560 = 1,089,000 (found the area in square feet)

33. Calculate the increase in population, then divide the increase by the previous population, changing the decimal answer to a percent.

A. Incorrect: 318,270 ÷ 249,583 = 1.275 → 12.75%, rounded up to 13% (divided the current population by the previous population and incorrectly changed the result to a percentage)
B. Incorrect: 318,270 – 249,583 = 68,687; 68,687 ÷ 318,270 = 0.216 = 21.6%, rounded up to 22% (divided the difference between the previous and current populations by the current population instead of the previous population)
C. **Correct:** 318,270 – 249,583 = 68,687; 68,687 ÷ 249,583 = 0.275 = 27.5%, rounded up to 28%
D. Incorrect: 318,270 – 249,583 = 68,687 → 68.7%, rounded up to 69% (incorrectly converted the difference between the previous and the current population to a percentage)
E. Incorrect: 249,583 ÷ 318,270 = 0.784 = 78.4%, rounded down to 78% (divided the previous population by the current population)