MATH TEST 1 EXPLANATIONS

Answer Key

Check your answers then refer to the relevant Answer Explanations for a break-down of why that answer is correct.

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

Math Breakdown

Preparing for Higher Math (80%)

Number & Quantity

Algebra

Functions

Geometry

Statistics & Probability

Integrating Essential Skills (20%)

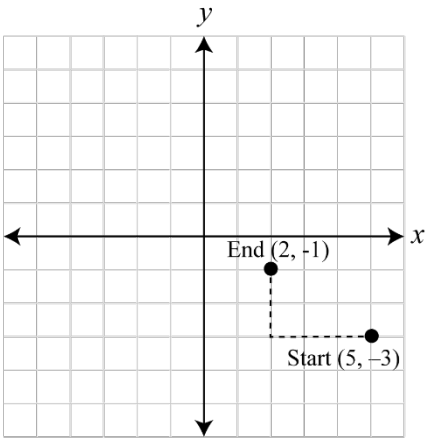
Modeling

Answer Explanations

In math there may be multiple ways to solve a problem, but the following explanations provide only *one* way.

Please note while we are providing a step-by-step explanation for solving these problems, we *highly recommend* you do not waste time by writing every step to solve similar problems when you are taking the ACT. Doing well on the ACT isn't just about knowing how to find the correct answer, but how to do it quickly.

Question 1



1. The robot moves horizontally for 6 seconds at .5 units per second: 6 × 0.5 = 3 units.
2. The starting horizontal position, which corresponds to the *x*-value, is 5, so moving 3 spaces in the negative direction makes the ending position 2: 5 + (–3) = 2.
3. The robot also moves vertically for 4 seconds at the same speed: 4 × .5 = 2 units.
4. The starting vertical position, which corresponds to the *y*-value, is –3, so moving 2 in the positive direction makes the ending position –1: (–3) + 2 = 1.
5. The final location is (2, –1)

Question 2

For this algebraic expression $\frac{21x^6y^4}{3x^3y}$

1. Simplify the coefficients: $\frac{21}{3}$ = 7
2. Follow the Quotient Rule and subtract the exponents in the denominator from the exponents in the numerator of the corresponding variables: $x^{6-3} = x^3$ and $y^{4-1} = y^3$ (Remember, if a variable has no exponent, you can assume it is 1).

Put the components of expression together: $7x^3y^3$

Question 3

To find the total meters run at the end of 10 days, we first need to determine how many meters he ran each day.

1. Day 1: 400
2. Day 2: 400 + 100 = 500
3. Day 3: 500 + 100 = 600
4. Day 4: 600 + 100 = 700
5. Day 5: 700 + 100 = 800
6. Day 6: 800 + 100 = 900
7. Day 7: 900 + 100 = 1,000
8. Day 8: 1,000 + 100 = 1,100
9. Day 9: 1,100 + 100 = 1,200
10. Day 10: 1,200 + 100 = 1,300

Now that we know how many meters he ran each day, we add those together:

400 + 500 + 600 + 700 + 800 + 900 + 1,000 + 1,100 + 1,200 + 1,300 = 8,500.

Timesaver Tip: Because the pattern is repeated addition, it is an arithmetic sequence, so if you know the proper formula, you can save some time. For an arithmetic sequence, the n^{th} term is $a_n = a_1 + (n-1)d$, where a_n is the n^{th} term, a_1 is the first number in a sequence, and d is the common difference.

In this problem, we know Michael started running 400m on day one, so $a_1 = 400$. The change he makes is to run 100m more each day, so $d = 100$. We want the total after 10 days, so $n = 10$.

This means:

1. $a_{10} = 400 + (10 - 1)100$
2. $a_{10} = 400 + (9)100$
3. $a_{10} = 400 + 900$
4. $a_{10} = 1300$

To find the sum, we would use $S_n = \frac{n}{2}(a_1 + a_n)$, so

5. $S_{10} = \frac{n10}{2}(400 + 1{,}300) = 8{,}500.$

Question 4

To determine the spaces available: Total – (already assigned) – (being repaired)

1. Already assigned: determine 5% of 160: (.05) × 160 = 8
2. Subtract that 8 and the 12 being repaired: 160 − 8 – 12 = 140

Question 5

For story problems, start with what you are given, then determine what you are being asked to find. This problem provides a starting amount of cooking oil and asks us to find the amount left after Ellie and Brittney both use some.

1. Start with the total amount provided: 8
2. Subtract the morning amount: $8 - 2\frac{1}{2} = 5\frac{1}{2}$
3. Now subtract the afternoon amount: $5\frac{1}{2} - 1\frac{1}{4} = 4\frac{1}{4}$

Timesaver Tip: Remember that $\frac{1}{2} = .05$ and $\frac{1}{4} = .25$ and entering decimals into a calculator can often be quicker than entering fractions.

Question 6

For story problems, determine what you know and what you need to determine. Here, you are given the total amount of liquid (laundry detergent) to divide into equal portions (bottles):

153 oz. ÷ 2.8 oz. = 54.64.

Because the .64 represents a partially filled bottle, the correct answer is 54 full bottles.

Question 7

Matrix addition is performed by adding corresponding elements (top left + top left, top right + top right, etc.).

$$\begin{bmatrix} (-7) + 8 & 3 + 5 \\ 9 + 1 & (-4) + (-3) \end{bmatrix}$$

Which gives us $\begin{bmatrix} 1 & 8 \\ 10 & -7 \end{bmatrix}$

Question 8

To find the slope, use the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$

1. If $(x_1, y_1) = (7, -3)$ and $(x_2, y_2) = (5, -6)$, then $m = \frac{(-6) - (-3)}{5 - 7}$
2. Next $m = \frac{(-6) + 3}{-2} = \frac{-3}{-2} = \frac{3}{2}$

Remember: you would get the same result if $(x_1\ \ y_1) = (5, -6)$ and $(x_2, y_2) = (7, -3)$.

Question 9

This is a right triangle, we need to use the cosine formula: $\cos x = \frac{adjacent}{hypotenuse}$

So the $\cos A = \frac{length\ of\ AC}{length\ of\ AB}$

$\cos A = \frac{5}{13}$

Question 10

There are many ways to solve a quadratic equation, but a good place to start is to try factoring.

1. Factor: $(x + 6)(x - 7) = 0$
2. Set each factor equal to zero:
    a. $x + 6 = 0$
    b. $x - 7 = 0$
3. Solve each equation: $x = -6$, $x = 7$
4. Find the sum of these solutions: $(-6) + (7) = 1$

Question 11

This question is asking for the length of one side of a triangle (BD). The larger triangle (ABD) consists of two smaller triangles. If the two smaller triangles are right triangles, then we could use the Pythagorean Theorem, $a^2 + b^2 = c^2$, to find the length of BD. Since we were given the lengths of all three sides for one of the smaller triangles (ABC), we can use the converse of the Pythagorean Theorem. In other words, if $a^2 + b^2$ does equal c^2, then triangle ABC is a right triangle.

With the information provided: AC = 1,600, BC = 1,200, and AB = 2,000 we need to know if

$1{,}600^2 + 1{,}200^2 = 2000^2$ is a true statement.

Because 2,560,000 + 1,440,000 does equal 4,000,000 we know ABC is indeed a right triangle.

Now that we know ∠ABC is a right triangle, we also know ∠BCD is a right triangle because they share BC. The length of BC was already provided, so we need to find the length of CD.

If AD = 2,500 and AC = 1,600, then AD – AC, or 2,500 – 1,600 gives us 900. Now we use the Pythagorean theorem this time to find BD.

1. $900^2 + 1{,}200^2 = (length\ of\ BD)^2$

2. $1{,}440{,}000 + 810{,}000 = 2{,}250{,}00$
3. $\sqrt{2,250,000}$ = 1,500

Question 12

Because the two right triangles are similar, then the lengths of their corresponding sides are proportional, so we know $\frac{3}{4} = \frac{hypotenuse\ of\ the\ smaller\ triangle}{hypotenuse\ of\ the\ larger\ triangle}$. We know the length of the hypotenuse on the smaller triangle, 12, and we want to know the length, let's call that *x*. So, we have $\frac{3}{4} = \frac{12}{x}$.

To solve for *x*

1. Use cross-multiplication:
   (3)(*x*) = (4)(12)
2. Simplify both sides: 3*x* = 48
3. Isolate x: $x = \frac{48}{3} = 16$

Question 13

The sum of the interior angles in a triangle is 180°, so we know

(4*x* + 12) + (7*x* – 34) + (6*x* – 2) = 180.

To solve for *x*

1. Group like terms: (4*x* + 7*x* + 6*x*) + (12 – 34 – 2) = 180
2. Simplify the like terms: (17*x*) + (–24) = 180
3. Move the constant to the other side of the equation: 17*x* = 180 + 24
4. Which gives us 17*x* = 204.
5. Divide both sides by the coefficient: *x* = 204 ÷ 17 = 12.

Question 14

The formula for an arithmetic sequence is $a_n = a_1 + (n - 1)d$.

In this problem, the information we have is that 28 is the 8th term, the common difference is 3, so we need to find a_1. If we use the given 8th term (a_8), then *n* = 8. We then plug the known information into the formula

1. 28 = $a_1 + (8 - 1)(3)$
2. 28 = $a_1 + (7)(3)$
3. 28 = $a_1 + (21)$
4. 28 – 21 = a_1
5. 7 = a_1

Question 15

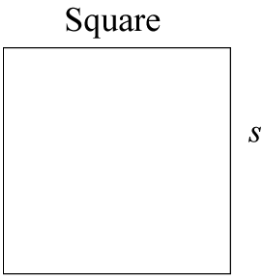
To isolate a variable, we need to perform inverse operations.

1. Divide both sides by *R*: $\frac{P}{R} = I^2$
2. Take the square root of both sides: $\pm\sqrt{\frac{P}{R}} = I$
3. Next, look at the available options provided by the ACT, and $\sqrt{\frac{P}{R}}$, the positive option, is available to choose.

Question 16

Recall that the formulas for perimeter and area of a square are:

- Perimeter = 4*s*
- Area = s^2



If the area is 1,600 then *s* = $\sqrt{1600}$ which is 40. Now we use the formula for perimeter, so 4(40) = 160.

Question 17

This question provides an equation to use, so start by identifying the known information and its place in the equation.

$$\frac{Turtles\ tagged\ in\ capture\ 1\ (\mathbf{168})}{Turtle\ population\ (\boldsymbol{x})} = \frac{Turtles\ tagged\ in\ capture\ 2\ (\mathbf{27})}{Turtles\ in\ capture\ 2\ (\mathbf{60})}$$

Which gives us the equation

$$\frac{168}{x} = \frac{27}{60}$$

To solve for *x*:

1. Use cross-multiplication: (168) (60) =(*x*) (27)
2. Simplify both sides: 10,080 = 27*x*
3. Isolate *x:* 10,080 ÷ 27 = 373.33

Rounding down to the nearest whole turtle, the correct answer is 373.

Question 18

The key to this question is understanding what $\sqrt{x^2}$ equals. By definition, the square root symbol will always return a positive number. So, if the question is asking when $\sqrt{x^2} \neq x$, we know the opposite can be true. In other words, if x was a negative number, once it is squared, it is now positive, so taking the square root will not give you back then negative value you started with.

Timesaver Tip: If you know the definition of a rational and irrational number, you can quickly eliminate answers C and D.

Question 19

Remember the mean is the total sum split evenly between the numbers, which in this case is 12. If that mean drops by 5 numbers, then each of the 12 numbers, on average, decreases by 5. So the total decrease equals 5 times the number of items: 5 × 12 = 60.

Question 20

1. Divide both sides by –1: $\frac{1}{64} = 4^x$
2. Rewrite the left side with a negative exponent so that neither side has a fraction: $64^{-1} = 4^x$
3. Rewrite both sides to have the same base: $(4^3)^{-1} = 4^x$
4. Simplify: $4^{-3} = 4^x$

If the bases are the same, then the exponents must be the same because this is an equation:

$-3 = x$.

Another way to think of this problem is to ask, "4 to what power equals 1/64?" Because 64 is a small number, it might be quickest to start by squaring 4, which gives us 16. If we multiply 16 by another 4, we get 64. This means $4 \times 4 \times 4 = 64$, or $4^3 = 64$.

Question 21

Remember the median is the middle score when ordered from lowest to highest. If we split 31 in half, we get 15.5. This means there were 15 scores below 76 points and 15 above 76 points.

Question 22

To answer this question, we need to

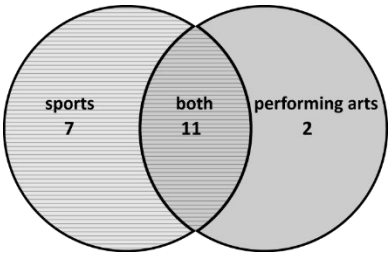
1. Calculate the total walked in feet: $(\frac{4{,}963 \text{ steps}}{1})(\frac{2.4 \text{ feet}}{1 \text{ step}})$ = 11,414.9 feet.
2. Next, we need to convert feet into miles: $\left(\frac{11{,}414.9 \text{ feet}}{1}\right)\left(\frac{1 \text{ mile}}{5{,}280 \text{ feet}}\right) = 2.16$ miles.
3. The problem asks us to round to the nearest tenth, so the correct answer is 2.2.

Tip: Remember, when converting units that you need the same units on the top of your fraction to cancel with the matching units on the bottom. The units you want remaining need to be on the top of your fraction.

Question 23

Not only do we need to determine how many students are involved in sports *or* performing arts, but we also need to account for the students who are involved in both:

1. 18 (sports) + 13 (performing arts) = 31
2. 31 (sports or performing arts) – 11 (do both) = 20
3. 30 total students – 20 = 10 who are not involved in either



Question 24

For story problems, start with what you are given, then determine what you are being asked to find. We are given the total price for varying amounts of coffee and donuts, then provided a maximum price we can pay for coffee(s) only.

If d = cost of one donut and c = cost of one coffee, then we know

Two Fridays ago: $5d + 2c = 18.20$
Last Friday: $9d = 16.20$

Solve the second equation for d: 16.20/9 = 1.80, the cost of one donut

Now that we know the cost of one donut, we can find out the cost of one coffee

1. Plug in the value of d: $5(1.80) + 2c = 18.20$
2. Simplify: $9 + 2c = 18.20$
3. Move constants to one side: $2c = 18.20 – 9 = 9.20$
4. Isolate the variable: $c = 9.20/2 = 4.60$
5. If Jordan only has $15 to spend and one coffee cost $4.60, then 15/4.60 = 3.26

Because you can't purchase a partial coffee, the correct answer is 3.

Question 25

When we are dealing with right triangles, we know we can use sine, cosine, or tangent to find the length of a side depending on what information about the sides of the triangle are provided.

For this problem, we are told Δ*ABC* is a right triangle and provided the length of the hypotenuse of Δ*ABD*. Because Δ*BDC* is also a right triangle, if we knew the length of the shared side *BD*, we could use that information to find the length of *DC*.

1. How is BD related to the 60° angle in Δ*ABD*? *It is opposite side*.
2. We know the hypotenuse of Δ*ABD* and want to know the length of the opposite side. What trig ratio relates to those two sides? *Sine*.
3. Write the equation: $\sin(60°) = \frac{x}{24}$, where *x* is the length of *BD*.
4. Solve for *x*: $x = 24 \cdot \sin(60°) = 12\sqrt{3}$
5. Since there are 180° in a triangle, we know $\angle ABD = 30°$: $180 - 90 - 60 = 30$.
6. Since $\angle ABC$ is 90° (given) and $\angle ABD = 30°$, then $\angle DBC = 60°$: $90 - 30 = 60$.
7. How is side *BD* related to this 60° angle ($\angle DBC$)? *Adjacent side*.
8. We want to know the length of *DC*. How is it related to $\angle DBC$? *Opposite side*.
9. What trig ratio relates to the opposite and adjacent sides of a right triangle? *Tangent*.
10. Write the equation: $\tan(60°) = \frac{z}{12\sqrt{3}}$, where *z* is the length of *DC*.
11. Solve for *z*: $z = (12\sqrt{3})\tan(60°) = 36$, which is the length of *DC*.

Timesaver Tip: The faster approach is to recognize that this is a pair of 30° - 60° - 90° triangles with the side length ratios of 1, 2, $\sqrt{3}$. Using this math fact, you can more quickly calculate the side lengths.

Question 26

Remember the standard equation of a circle: $(x - h)^2 + (y - k)^2 = r^2$, where (*h*, *k*) is the center of a circle.

1. Plug in the numbers provided in the problem: center at (–8, 7) and $r = 4$.
2. $(x - (-8))^2 + (y - (7))^2 = (4)^2$
3. Simplify: $(x + 8)^2 + (y - 7)^2 = 16$

Timesaver Tip: If you know the standard equation of a circle, you can quickly square the radius of 4, which equals 16. Doing the mental math means you can quickly eliminate answer C.

Question 27

It often helps to rewrite the problem with the information provided: $h(4) = f(4) - g(4)$

Because there are multiple ways to approach this problem, we recommend an approach that minimizes errors.

1. Find the value of each function: $h(4) = ((4)^2 + 5(4) + 7) - ((4)^2 - 7(4) + 2))$
2. $h(4) = (43) - (-10)$
3. $h(4) = 53$

Tip: Minimize the number of times you use your calculator. For example, to simplify $(4)^2 + 5(4) + 7$, consider typing 16 + 20 + 7 to save time. Do what you can in your head!

Question 28

1. Use substitution to replace *x* with $g(x)$: $f\big(g(x)\big) = \big(g(x)\big)^2 - 2$
2. Replace $g(x)$ with $x - 5$: $(x-5)^2 - 2$
3. Simplify: $x^2 - 10x + 25 - 2 = x^2 - 10x + 23$

Question 29

1. Cross-multiply: $7(3x - 2y) = 3(5x - 3y)$
2. Simplify: $21 - 14y = 15x - 9y$
3. Move *x* terms to one side and *y* terms to the other: $21x - 15x = 14y - 9y$
4. Simplify: $6x = 5y$
5. Divide both sides by *y*: $\frac{6x}{y} = 5$
6. Divide both sides by 6: $\frac{x}{y} = \frac{5}{6}$

Question 30

From the number line we're given $-1 < a < 0$ and $0 < b < 1$. We know *ab* is negative because a positive times a negative is negative. So how do you decide between $ab < 0$ and $ab < -1$?

If we ignore that these numbers could be negative for a moment and think about them as decimals or percentages, then imagine taking less than 100% of a number that's already less than 100%. Your result would be even smaller (closer to zero). This is why $ab < -1$ isn't true and $ab < 0$ is true.

Question 31

1. Rewrite the expression: $\frac{x+y}{y} = \frac{x}{y} + \frac{y}{y} = \frac{x}{y} + 1$
2. Set the bounds for $\frac{x}{y}$: $0 \leq \frac{x}{y} \leq \frac{7}{4}$
3. Add 1 to each part: $0 + 1 \leq \frac{x}{y} + 1 \leq \frac{7}{4} + 1$, or $1 \leq \frac{x+y}{y} \leq \frac{11}{4}$
4. The set of possible values is $\left[1, \frac{11}{4}\right]$
5. When checked against the possible responses, only $\frac{9}{4}$ fits.

Question 32

The amplitude of a cosine function is $|a|$ in $y = a \cdot \cos(bx + c)$. Since *a* = 4, the $|4|$ = 4, which is the amplitude.

Trap Alert: Not every math problem will require computation. The ACT often tests your understanding of concepts. In this case, the test is essentially asking a vocabulary question. This is why it's important to not just memorize formulas and plug in numbers, but to understand truly what each formula represents.

Question 33

For story problems, determine what you are provided and what you need to determine. Also, be on the lookout for keywords like *only, not, least, greatest, except*. Notice the question asks us to determine the average speed *when* Charlie was traveling.

The graph includes the time Charlie spent at each destination, but we are looking for *when* he was traveling.

1. Pulling information from the graph, we extract the following:
    a. Time to the first destination: 1 hour
    b. Time to the second destination: 2 hours
    c. Time to the third destination: 1 hour
    d. Time to the fourth destination: 2 hours
    e. Total distance traveled: 300 miles
2. With the information from the graph, we can find the average speed: $\frac{distance}{time}$
   $\frac{300\ miles}{6\ hours}$ = 50 mph

Tip: Notice that the problem gave you a hint, "average speed, in miles per hour," this is a hint to take the miles (distance) and divide it (per) by time (hr).

Question 34

When being asked which of the following options is equivalent to what is given, quickly skim the answer choices. Here we see that all the answer choices are one fraction and the expression in the question has two fractions. This tells us how to begin: add our fractions together.

1. Find common denominators: $\frac{7(x)}{x(x)} + \frac{4}{x^2} = \frac{7}{x^2} + \frac{4}{x^2}$
2. Add numerators; keep denominators: $\frac{7x+4}{x^2}$

Question 35

1. Start by setting up each component as worth a percentage of the final grade, multiply each score by its weight:
    a. Course grade = (Test 1 × 20%) + (Test 2 × 20%) + (Test 3 × 20%) + (Final × 40%)
2. Plug in the known values; where *x* is the unknown final exam score:
    a. Course grade = (82 × 0.20) + (71 × 0.20) + (81 × 0.20) + (*x* × 0.40)
3. Simplify:
    a. Course grade = 16.4 + 14.2 + 16.2 + 0.40*x* = 46.8 + 0.40*x*
4. Set up the inequality: 46.8 + 0.40*x* ≥ 80
5. Move constants to one side: 0.40*x* ≥ 80.0 – 46.8
6. Simplify: 0.40*x* ≥ 33.2
7. Solve for *x*: *x* ≥ 33.2/0.40, so the correct answer is 83%

Question 36

The problem asks for the area of the triangle, so that we know we will need to determine the base and the height.

1. Start with any segment that has endpoints that share the same *x* or *y* coordinate to use as the base. For this triangle, that's *AB*: the distance between –3 and 4 is 7, so *AB* = 7.
2. We also need the height, which is the distance between *AB* and *C*: 7 – (–1) = 8
3. Now we use the formula for Area: $A = \frac{1}{2} \times base \times height$:
   A = .5(7)(8) = 28

Question 37

This question is really asking you to find the least common multiple (LCM) of 6 and 16. To find the LCM:

1. List the prime factors of each number: $2 \cdot 3$ and 2^4.
2. Multiply the highest power of each prime factor: $2^4 \cdot 3^1 = 48$

So, the LCM of 6 and 16, which is the next time the turn signals will flash again at the same time, is 48 seconds.

Trap Alert: It might seem like the quickest way to find a time when a 6- and 16-second signal will both flash at the same time is to multiply them, which gives us 96. Although that does give us a time when both turn signals flash at the same time, the question is asking for how many seconds until the *next* time.

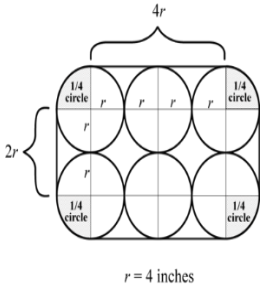
Question 38

We know to get from *A* to *B*, you would need to move 3 units right. Because we provided a ratio *AB*:*BC* is 1:2 we know to get from *B* to *C*, you would need to move twice as far (6 units right).

To get from *A* to *B*, you would need to move 6 units up. Based on the provided ratio, we know to get from *B* to *C*, you would need to move twice as far (12 units up). So, C = (1 + 6, 2 + 12) = (7, 14)

Question 39

The strap at the top (center) has a length of 4 times the radius of the pipes, and that length is duplicated at the bottom. Similarly, the strap on the left (center) has a length of 2r, which is duplicated on the right. At each corner, the strap goes around a quarter of the pipe. This happens at all 4 corners resulting in a length of the circumference of one pipe: 2πr.



In other words, think of this as multiple figure—a rectangle and a circle.
So, the total length is 2 (4r) + 2(2r) + 2πr. We were given that r = 4in, so the length is $2(4 \cdot 4) + 2(2 \cdot 4) + 2\pi(4) \approx 73.1$ in.

Question 40

$(5 - bi)(?)$ equals a rational number. This means that it also equals a real number, so you must multiply by the conjugate: $(5 + bi)$. $(a + bi)(a - bi) = a^2 + b^2$ because $i^2 = -1$.

Question 41

Evaluating logarithms is often challenging, so rewriting them in their exponential form is often helpful: $x^y = 25$. We were given $x < 25$, and if *x* did equal 25, *y* would equal one. So, what if *y* equaled two? Is there an integer (positive or negative whole number) squared that equals 25? Yes, $5^2 = 25$. So 2 is a possible value.

Note: If 2 was not a possible value, we would ask if there was an integer to the power of 3 that equals 25 and continue guessing and checking.

Question 42

1. When multiplying like bases, we add the exponents: $x^{\frac{1}{3}+\frac{3}{4}}$
2. To add them, we need to rewrite the fractions with a common denominator: $x^{\frac{4}{12}+\frac{9}{12}}$
3. This gives us $x^{\frac{13}{12}}$. Again, we need to consider another way to write the same information, such as: $\sqrt[12]{x^{13}}$

Take Note: When rewriting an expression from exponential form to radical form, the number in the denominator of the fraction of the exponent is in the index of the radical (root).

Question 43

The smallest angle in a triangle is always opposite the shortest side. The sides are 14, 16, and 19, so the shortest is 14. This means A is the smallest angle.

The Law of Cosines states: $a^2 = b^2 + c^2 - 2(b)(c)cosA$

Plug in the values provided: $14^2 = 16^2 + 19^2 - 2(b)(c)cosA$

Take Note: Notice that no one asked you to simplify. Take a minute and glance at the options to see what kind of work is needed.

Question 44

From the information provided, we know $Q's\ maximum\ > R's\ maximum$. We also know 8 of the 9 numbers in each set are the same. As such, we only need to focus on the maximum number for each set.

It's best to consider each possible answer, one-by-one.

- If the maximum of Q is greater than R, then the mean of $Q\ > R$ = True. Remember, the mean is the sum divided by the quantity of numbers. So, if the max is larger, then the sum is larger and therefore the mean larger. However, we need to determine if the other possible answers are true or false to determine if "just the mean" is the correct answer.
- If only the maximum is greater in Q and both sets otherwise have the same numbers, the median will be the same for both.
- If the maximum of Q is greater than R, then the range of $Q\ > R$ = True. The range is the difference between the largest and smallest values so if the largest number is further away from the smallest, that difference will be larger too.
- As determined previously, the mean and the range are both greater while the median is the same for both sets, so J is the correct answer.

Question 45

First, we need to determine all the possible combinations of car rentals Sharon could encounter. In other words, the number of ways to choose 3 cars from the 14 when order does not matter. For this we use $_nC_r = \frac{n!}{(n-r)!r!}$ where *n* is the number of options and *r* is how many chosen.

$$_{14}C_3 = \frac{14!}{(14-3)!\,3!} = \frac{14\cdot 13\cdot 12\cdot 11!}{11!\,3!} = \frac{14\cdot 13\cdot 12}{3\cdot 2\cdot 1} = 364$$

Tip: Most scientific calculators have $_nC_r$ and $_nP_r$ buttons or commands, so you don't need to memorize the formulas, just know which one to use and what *n* and *r* represent.

AI Statement: A human subject matter expert has reviewed all content for accuracy. Copilot and other AI chatbots were used in the co-constructing of most examples, non-examples, and explanatory text, as well as to conduct quality assurance checks to ensure rigor and consistency.