Question 1 Test 2, Second QR Section (version 3)
In City X, the range of the daily low temperatures during....
QA: The range of the daily low temperatures in City X.... **QB: 30° Fahrenheit**
Arithmetic: Ranges Answer: *The relationship cannot be determined.*

1. With this quantitative comparison question, your goal should be to see whether the range for the two-month period can be both less than and greater than 30°F. Start by DIAGRAMMING the question and SUPPLYING numbers that would satisfy a 20°F range in June and a 25°F range in July but also create a two-month range less than 30°F.

JUNE		JULY	
Lowest Daily Low	Highest Daily Low	Lowest Daily Low	Highest Daily Low
5°F	25°F	0°F	25°F

Range in June: 25°F – 5°F = 20°F Range in July: 25°F – 0°F = 25°F

Two-month period:
Highest: 25°F (June and July)
Lowest: 0°F (July)
Two-month range: 25°F – 0°F = 25°F This is less than Quantity B.

Now see if you can make the two month range greater than 30°F:

JUNE		JULY	
Lowest Daily Low	Highest Daily Low	Lowest Daily Low	Highest Daily Low
5°F	25°F	50°F	75°F

Range in June: 25°F – 5°F = 20°F Range in July: 75°F – 50°F = 25°F

Two-month period:
Highest: 75°F (July)
Lowest: 5°F (June)
Two-month range: 75°F – 5°F = 70°F This is greater than Quantity B.

The relationship cannot be determined.

Question 2 Test 2, Second QR Section (version 3)
For all positive numbers *p*, the operation ▼ is defined by $p^{\blacktriangledown}$....

QA: $\left(\left(\frac{2}{7}\right)^{\blacktriangledown}\right)^{\blacktriangledown}$ **QB: 3.5**

Algebra II: Symbolic Functions Answer: *Quantity A is greater*

1. This compound symbolic function is intimidating to most students, but it doesn't take nearly as long as you think because of a time-saving shortcut.

   To begin, set up the function, working from the inside out of Quantity A. Wherever a *p* appears in the function, insert 2/7:

$$p^{\blacktriangledown} = p + \frac{1}{p}$$

$$\left(\frac{2}{7}\right)^{\blacktriangledown} = \frac{2}{7} + \frac{1}{\frac{2}{7}} \qquad \frac{1}{\frac{2}{7}} \text{ is the same as } \frac{7}{2}$$

$$\left(\frac{2}{7}\right)^{\blacktriangledown} = \frac{2}{7} + \frac{7}{2} \quad \rightarrow \quad 0.29 + 3.5 \quad \rightarrow \quad 3.79$$

   Astute test takers will realize that 7/2 is the same as 3.5 (Quantity B) and that we are adding a positive value (0.29) to (3.5) so the Quantity in A is already greater than Quantity B, before we even perform the second part of the function (which will also increase Quantity A).

   But if you are still not convinced, you can complete the problem. Note that it's easier to use decimals at this point. Since $\left(\frac{2}{7}\right)^{\blacktriangledown} = 3.79$, place 3.79 for every *p* in the function:

$$p^{\blacktriangledown} = p + \frac{1}{p}$$

$$3.79^{\blacktriangledown} = 3.79 + \frac{1}{3.79}$$

$$3.79^{\blacktriangledown} = 3.79 + 0.26$$

$$3.79^{\blacktriangledown} = 4.05$$

$$\left(\left(\frac{2}{7}\right)^{\blacktriangledown}\right)^{\blacktriangledown} = 4.05 \qquad \text{Quantity A is greater.}$$

Question 3 Test 2, Second QR Section (version 3)
***x* > 0 and x^4....**
QA: The greatest prime factor of 36*x* QB: 5
Arithmetic: Number Properties Answer: *The two quantities are equal*

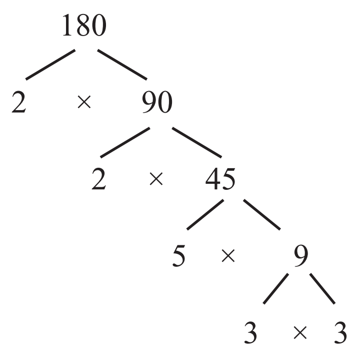
1. First, find x:

   $x^4 = 625 \quad \rightarrow \quad x = 5$ or -5
   However, the question states that $x > 0$, so $x = 5$

2. Now find $36x$:

   $36x \quad \rightarrow \quad (36)(5) \quad \rightarrow \quad 180$

3. Use a factor tree to find the prime factors of 180:

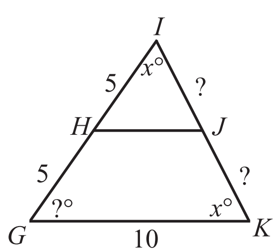


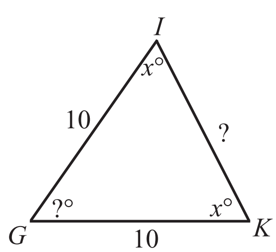
$180 = 2 \times 2 \times 5 \times 3 \times 3$

The greatest prime factor of 180 is 5, so the two quantities are equal.

Question 4 Test 2, Second QR Section (version 3)
***H* is the midpoint of *IG*....**
QA: *IJ* QB: 5
Geometry: Triangles Answer: *The relationship cannot be determined*

1. It may help some test takers to DIAGRAM the question. In fact, it may be easier to simplify the image by removing points H and J:





By removing H and J, we can see this is an isosceles triangle. Because the length of one side of the a triangle must be less than the sum of the other two sides, we know IJ must be between 0 (if J is very close to I) and 20 (if J is very close to K). The figure is not necessarily drawn to scale, remember. If $IJ = 1$, then Quantity B is greater. But if $IJ = 19$, then Quantity A is greater. The relationship cannot be determined.

Question 5 Test 2, Second QR Section (version 3)
***n* is an integer....**
QA: The greatest possible value of *n* minus the least possible value of *n* QB: 12
Arithmetic: Number Properties Answer: *The two quantities are equal*

1. What is the greatest possible value of n?

   $n^2 < 39$
   If $n = 6$: $6^2 = 36 < 39$ ✓
   If $n = 7$: $7^2 = 49 > 39$ × The greatest possible value of n is 6.

2. What is the least possible value of n? Be careful here! Some test takers will select 0, but they will be wrong. Don't forget negative numbers!

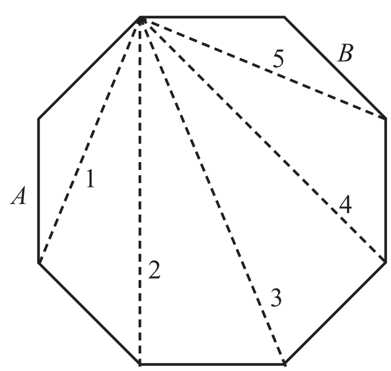
   $n^2 < 39$
   If $n = -6$: $-6^2 = 36 < 39$ ✓
   If $n = -7$: $-7^2 = 49 > 39$ × The least possible value of n is –6.

3. Calculate the greatest possible value of n minus the least possible value of n:

   $6 - -6 \rightarrow 6 + 6 \rightarrow 12$ The two quantities are equal.

Question 6 Test 2, Second QR Section (version 3)
The figure above is a regular octagon....
QA: Number of diagonals that are parallel to at least on side of the octagon
QB: Number of diagonals that are <u>not</u> parallel to any side of the octagon
Geometry: Polygons Answer: *Quantity B is greater*

1. DIAGRAM the question, adding the diagonals:



As you can see, diagonal 2 is parallel to side A and diagonal 4 is parallel to side B. So there are 2 diagonals parallel to at least one side and 3 diagonals (1, 3, and 5) that are not parallel to any side.

Every vertex of the octagon will produce 2 diagonals that are parallel to at least one side and 3 diagonals that are not parallel to any side. Thus, Quantity B is greater.

Question 7 Test 2, Second QR Section (version 3)
The function f is defined by $f(x) = 5x +$....
QA: $f(t + 54) - f(t + 50)$ QB: 20
Algebra II: Functions Answer: *The two quantities are equal*

1. Start by finding $f(t + 54)$:

$$f(x) = 5x + 1$$
$$f(t + 54) = 5(t + 54) + 1$$
$$f(t + 54) = 5t + 270 + 1$$
$$f(t + 54) = 5t + 271$$

2. Now find $f(t + 50)$:

$$f(x) = 5x + 1$$
$$f(t + 50) = 5(t + 50) + 1$$
$$f(t + 50) = 5t + 250 + 1$$
$$f(t + 50) = 5t + 251$$

3. Now find $f(t + 54) - f(t + 50)$.

$f(t + 54) - f(t + 50)$
$(5t + 271) - (5t + 251)$ Be careful to distribute the negative to the second function!
$(5t + 271) - 5t - 251$
$271 - 251$
20 The two quantities are equal.

Question 8 Test 2, Second QR Section (version 3)
How many different two-digit positive integers...?
Statistics: Counting Problems Answer: *12*

1. This is a basic combination problem. There are three possibilities for the tens digit: 7, 8, and 9. There are four possibilities for the units digit: 0, 1, 2, and 3.

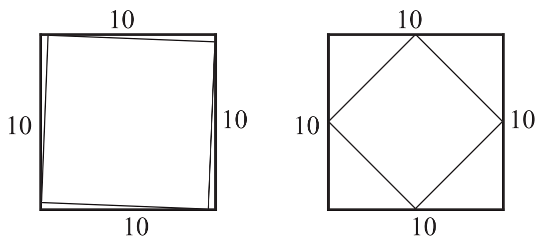
   3 possibilities × 4 possibilities = 12

2. If you forget how to compute a combination, you can count the two-digit numbers:

   70, 71, 72, 73, 80, 81, 82, 83, 90, 91, 92, 93 There are a total of 12 numbers in the list.

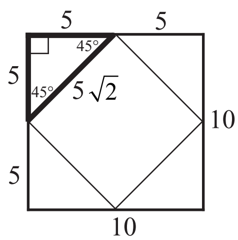
Question 9 Test 2, Second QR Section (version 3)
The perimeter of square *S* is 40....
Geometry: Quadrilaterals Answer: *50*

1. An inscribed figure is one that is drawn inside another with only the sides touching, so square T will be placed inside of square S. DIAGRAM the question, both with square T as large as possible and with T as small as possible:



As you can see, the closer the vertex of square T to a vertex of square A, the larger the area of square T. Square T has its least possible area when its vertex bisects each side of square S.

2. Now use square S to find the length of one side of square T:



The triangle that constitutes the space between square T and square S is a 45:45:90 triangle. This helps us determine that the length of one side of square T is $5\sqrt{2}$.

3. Finally, find the area of square T:

Area = side^2
Area = $(5\sqrt{2})^2 \rightarrow (5^2)(\sqrt{2}^2) \rightarrow (25)(2) \rightarrow 50$

Question 10 Test 2, Second QR Section (version 3)
Kelly took three days to travel from City *A* to City *B*....
Arithmetic: Fractions Answer: $1 - \frac{2}{5} - \frac{2}{3}(1 - \frac{2}{5})$

1. Day 1: Kelly traveled $\frac{2}{5}$ of the distance, so her remaining distance is $1 - \frac{2}{5}$.

2. Day 2: Kelly traveled $\frac{2}{3}$ of the remaining distance, or $\frac{2}{3}(1 - \frac{2}{5})$.

3. Day 3: Kelly traveled the rest of the way. $1 - \frac{2}{5} - \frac{2}{3}(1 - \frac{2}{5})$.

Question 11 Test 2, Second QR Section (version 3)
If x and y are integers and $x = 50y + 69$...?
Algebra: Equations and Number Properties Answer: $x + 2y$

1. SUPPLY both an odd and even number for y and find the resulting x values:

   If $y = 1$
   $x = 50y + 69 \rightarrow x = 50(1) + 69 \rightarrow x = 119$

   If $y = 2$
   $x = 50y + 69 \rightarrow x = 50(2) + 69 \rightarrow x = 169$

2. Using these values, test each answer choice:

   xy:
   If $y = 1$, $x = 119$ $xy = (119)(1) \rightarrow 119$ ✓
   If $y = 2$, $x = 169$ $xy = (169)(2)$ (Note: any integer times 2 will be even) $\rightarrow 338$ ✗

   $x + y$:
   If y = 1, x = 119 $x + y = 119 + 1 \rightarrow 120$ ✗
   No need to test $y = 2$, $x = 169$

   $x + 2y$:
   If $y = 1$, $x = 119$ $x + 2y = 119 + 2(1) \rightarrow 121$ ✓
   If $y = 2$, $x = 169$ $x + 2y = 169 + 2(2) \rightarrow 173$ ✓
   This is the answer; adding an odd number to an even number is always going to result in an odd number. You can check the last two answer choices to be sure.

   $3x – 1$:
   If $y = 1$, $x = 119$ $3x - 1 = 3(119) - 1 \rightarrow 357 - 1 \rightarrow 356$ ✗
   No need to test $y = 2$, x = 169

   $3x + 1$:
   If $y = 1$, $x = 119$ $3x + 1 = 3(119) + 1 \rightarrow 357 + 1 \rightarrow 358$ ✗
   No need to test $y = 2$, $x = 169$

Question 12 Test 2, Second QR Section (version 3)
In the first half of last year, a team won 60 percent of the games....
Arithmetic: Percents Answer: *90*

1. RECORDING and TRANSLATING will help you set up the equation for this question.

   Total games last year = t
   Games in 2nd half of year = 20
   Games in 1st half of year = $t - 20$

   60% of games in first half + 3 games in second half = 50% of the total games

   $0.60 \times (t - 20) + 3 = 0.50 \times t$

   $0.60(t - 20) + 3 = 0.50t$
   $0.60t - 12 + 3 = 0.50t$
   $0.60t - 9 = 0.50t$
   $-9 = -0.10t$
   $90 = t$

Question 13 Test 2, Second QR Section (version 3)
How many different two-digit positive integers are there...?
Arithmetic: Percents and Number Properties Answers: *30, 35, 40*

1. Since x is rounded to the nearest integer (3), the actual percentage could be anything between 2.5% and $3.49\overline{9}$%, because all of these numbers would round to 3.

2. Find the number of people that could be represented by these two extremes:

   2.5% of 1150 people → 0.025×1150 → 28.75 people
   $3.49\overline{9}$% of 1150 people → 0.03499×1150 → 40.24 people

   This range of percentages represents between 29 and 40 people (because we cannot have 28.75 people or 40.24 people). So 30, 35, and 40 are all possibilities.

   Note: If you only calculated 3.4% instead of 3.499%, you will miss 40 as a correct answer choice.

Question 14 Test 2, Second QR Section (version 3)
THREE TYPES OF ELECTRONIC UNITS TABLE AND GRAPH
The total number of GPS in stock last month...?

Data Analysis: Fractions Answer: $\frac{2}{3}$

1. Find the total number of GPS units in stock in Stores R and T:

R: 55
T: 25
R + T = 80

2. Find the total number of GPS units in all three stores:

R: 55
S: 40
T: 25
R + S + T = 120

3. Find the fraction:

$$\frac{80}{120} \rightarrow \frac{8}{12} \rightarrow \frac{2}{3}$$

Question 15 Test 2, Second QR Section (version 3)
THREE TYPES OF ELECTRONIC UNITS TABLE AND GRAPH
The number of television sets sold by Store R last month was approximately what percent...?
Data Analysis: Percents Answer: *56%*

1. Find the number of TV sets sold by Store R:

Table: 40 in stock
Graph: 50% sold

50% of 40 → 0.50×40 → 20

2. Find the number of TV sets sold by Store T:

Table: 50 in stock
Graph: 90% sold

90% of 50 → 0.90×50 → 45

3. Use the percent change formula to find the <u>approximate</u> percent decrease:

Percent change = decrease ÷ original number × 100
$(45 - 20) \div 45 \times 100 \rightarrow 25 \div 45 \times 100 \rightarrow 0.555 \times 100 \rightarrow 55.5\%$

Question 16 Test 2, Second QR Section (version 3)
THREE TYPES OF ELECTRONIC UNITS TABLE AND GRAPH
Each of the CD players sold by Store S last month was sold at the price of $119.95....
Data Analysis: Percents Answer: *$9,240*

1. Find the number of CD players sold by Store S:

   Table: 90 in stock
   Graph: 80% sold

   80% of 90 → 0.80 × 90 → 72

2. Find the total cost of one CD player with sales tax:

   Sales tax: 7% or 0.07

   $119.95 × 1.07 = $128.3465 (Since we are approximating, round to $128.35)

   If you forget how to compute sales tax, you can find the tax and add it to the item:

   7% of $119.95 → 0.0.07 × 119.95 → 8.3965 (round to 8.4)

   $119.95 + 8.4 = $128.35

3. Now find the cost of 72 CD players:

   72 CD players × $128.35 → $9241.20 The closest answer is $9,240.

Question 17 Test 2, Second QR Section (version 3)

In the sequence $a_1, a_2, a_3, \ldots, a_{100}$, the kth term is defined by $a_k, = \frac{1}{k}$ ....

Sequences Answer: $\frac{100}{101}$

3. Remember, the key to most GRE sequence questions is discovering a pattern among the terms. So start off by finding the first few terms and looking for a pattern.

$$a_1 = \frac{1}{1} - \frac{1}{1+1} \quad \rightarrow \quad a_1 = 1 - \frac{1}{2} \quad \rightarrow \quad a_1 = \frac{1}{2}$$

$$a_2 = \frac{1}{2} - \frac{1}{2+1} \quad \rightarrow \quad a_2 = \frac{1}{2} - \frac{1}{3} \quad \rightarrow \quad a_2 = \frac{1}{6}$$

$$a_3 = \frac{1}{3} - \frac{1}{3+1} \quad \rightarrow \quad a_3 = \frac{1}{3} - \frac{1}{4} \quad \rightarrow \quad a_3 = \frac{1}{12}$$

There doesn't seem to be a pattern in the actual terms (1/2, 1/6, 1/2), but easiest solution lies in the pattern in the second step:

$$a_1 = 1 - \frac{1}{2} \qquad a_2 = \frac{1}{2} - \frac{1}{3} \qquad a_3 = \frac{1}{3} - \frac{1}{4}$$

Imagine finding the sum for the terms using the second step:

$$1 - \cancel{\frac{1}{2}} + \cancel{\frac{1}{2}} - \cancel{\frac{1}{3}} + \cancel{\frac{1}{3}} - \frac{1}{4} = ?$$

Do you see the pattern? All but the first and last items cancel each other out!

Therefore, the only addends that matter to the sum are the first addend of a_1 and the last addend of a_{100}, so find the second step of the 100th term:

$$a_{100} = \frac{1}{100} - \frac{1}{100+1} \quad \rightarrow \quad a_{100} = \frac{1}{100} - \frac{1}{101}$$

The first addend of a_1 is 1 and the last addend of a_{100} is $-\frac{1}{101}$, so find the sum:

$$1 - \frac{1}{101} \quad \rightarrow \quad \frac{101}{101} - \frac{1}{101} \quad \rightarrow \quad \frac{100}{101}$$

Question 18 Test 2, Second QR Section (version 3)
If | x + 1 | ≤ 5, and | y – 1 | ≤ ...?
Algebra: Inequalities Answer: *–36*

1. Find | x + 1 | ≤ 5:

   $-5 \leq x + 1 \leq 5 \quad \rightarrow \quad -6 \leq x \leq 4$

2. Now calculate | y – 1 | ≤ 5:

   $-5 \leq y - 1 \leq 5 \quad \rightarrow \quad -4 \leq y \leq 6$

3. To find the least possible value of the product xy, SUPPLY numbers from the extremes of x and y. Keep in mind that two positive numbers and two negative numbers will result in a positive number. Since we want the least value, we are looking for a negative number and must use one positive and one negative value to obtain it.

   If $x = 4$ and $y = -4$, then $xy = -16$
   If x = –6 and y = 6, then $xy = -36$

   The least possible value is –36.

Question 19 Test 2, Second QR Section (version 3)
PERCENT CHANGES GRAPH
The graph shows the percent changes in the annual city tax revenue....
Data Analysis: Percents Answer: *$782,000*

1. Start with 1990 to 1995. According to the graph, City B suffered a 15% *decrease* in this time frame. Knowing the tax revenue in 1990 was 800,000, you can find the tax revenue in 1995 (x) using the percent change formula:

   Decrease = Original number – New number
   Decrease = 800,000 – x

   Percent change = decrease ÷ original number × 100
   $15 = (800{,}00 - x) \div 800{,}000 \times 100$
   $\frac{15}{100} = (800{,}00 - x) \div 800{,}000$
   $\frac{(800{,}000)(15)}{100} = 800{,}00 - x$
   $120{,}000 = 800{,}00 - x$
   $-680{,}000 = -x$
   $680{,}000 = x$

   This value, 680,000, is the annual tax revenue in 1995. It experienced a 15% decrease and fell from 800,000 in 1990 to 680,000 in 1995.

2. Now we need to find the annual tax revenue in 2000. According to the graph, City B experienced a 15% *increase* from 1995 (680,000) to 2000 (?). Again, use the percent change formula:

   Increase = New number – Original number
   Increase = y – 680,000

   Percent change = increase ÷ original number × 100
   $15 = (y - 680{,}000) \div 680{,}000 \times 100$
   $\frac{15}{100} = (y - 680{,}000) \div 680{,}000$
   $\frac{(680{,}000)(15)}{100} = y - 680{,}000$
   $102{,}000 = y - 680{,}000$
   $782{,}000 = y$

   This value, 782,000, is the annual tax revenue in 2000. It experienced a 15% increase and raised from 680,000 in 1995 to 782,000 in 2000.

Question 20 Test 2, Second QR Section (version 3)
If x, y, and z are positive numbers such that $3x <$ ...?
Algebra: Inequalities and Number Properties Answers: $y = z$, $y > z$, and $x > z$

1. SUPPLY numbers to satisfy each answer choice and see if $3x < 2y < 4z$ remains true. Because we are trying to determine if each statement could be true, we only need a single instance in which the statement produces a true equation for the answer choice to be correct.

$x = y$:
If $x = 1$, $y = 1$ $3x < 2y$ → $(3)(1) < (2)(1)$ → $3 < 2$ ✗
Will it work with a larger number?
If $x = 100$, $y = 100$ $3x < 2y$ → $(3)(100) < (2)(100)$ → $300 < 200$ ✗
This one cannot ever be true, no matter how large the number we supply for x an y.

$y = z$:
If $y = 1$, $z = 1$ $2y < 4z$ → $(2)(1) < (4)(1)$ → $2 < 4$ ✓
This statement could be true.

$y > z$:
If $y = 1.1$, $z = 1$ $2y < 4z$ → $(2)(1.1) < (4)(1)$ → $2.2 < 4$ ✓
This statement could be true.

$x > z$:
If $x = 1.1$, $z = 1$ $3x < 4z$ → $(3)(1.1) < (4)(1)$ → $3.3 < 4$ ✓
This statement could be true.