Question 1   Test 1, Second QR Section (version 2)
Two triangles
QA: x **QB:** y
Geometry: Triangles   Answer: *Quantity A is greater*

1. The astute student might recognize the 30:60:90 and 45:45:90 triangle right away. We know
    the triangle on the left is 30:60:90, because any right triangle with a hypotenuse twice as long
    as another side is a 30:60:90. Thus, x is $4\sqrt{3}$. Similarly, the second right triangle has two sides
    of the same length, so we know it is a 45:45:90 triangle. This means y is $4\sqrt{2}$. Quantity A is
    greater.

2. If you do not see the special right triangles, use the Pythagorean Theorem to find x and y:

    $a^2 + b^2 = c^2$ $a^2 + b^2 = c^2$
    $4^2 + x^2 = 8^2$ $4^2 + 4^2 = y^2$
    $16 + x^2 = 64$ $16 + 16 = y^2$
    $x^2 = 48$ $32 = y^2$
 $x = 6.928$ $5.657 = y$

3. Compare the two quantities: x is greater than y.

Question 2   Test 1, Second QR Section (version 2)
AB = BC
QA: Area of ΔABD   QB: Area of ΔBCD
Geometry: Triangles   Answer: *The two quantities are equal*

1. Some test takers might immediately recognize that the two triangles have the same height and
    base, thus the areas are equal. But if not, consider each triangle separately, in which we have
    created point X to illustrate the height of both triangles.
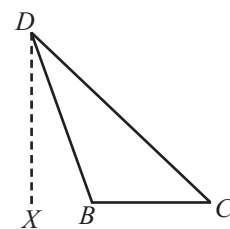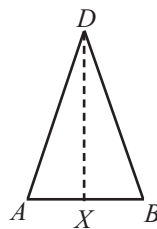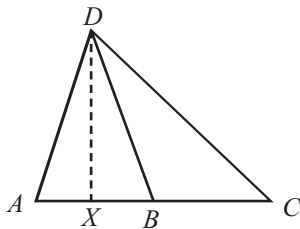
Because AB = BC, we know the two triangles have the same base measurement. And line DX
proves that both triangles have the same height. Since area = one-half of the base times the height
($\frac{1}{2}bh$), these two triangles have the same area.

Question 3   Test 1, Second QR Section (version 2)
Ray is 2 inches taller than....
QA: Average height of Ray, Lin, and Sam   QB: Median height of Ray, Lin, and Sam
Statistics: Average and Median   Answer: *Quantity A is greater*

1. Sam is the shortest since he is 3 inches shorter than Ray and Lin is only 2 inches shorter than Ray. Therefore, make Sam = x. If Sam = x, then Lin = $x + 1$ and Ray = $x + 3$.

2. In the set $\{x, x + 1, x + 3\}$, $x + 1$ is the median (Quantity B).

3. Plug these expressions into the average formula to find Quantity A:

$$\frac{\text{sum}}{\text{\# of \#s}} = \text{average} \quad \rightarrow \quad \frac{x+(x+1)+(x+3)}{3} \quad \rightarrow \quad \frac{3x+4}{3} \quad \rightarrow \quad \frac{3x}{3}+\frac{4}{3} \quad \rightarrow \quad x+\frac{4}{3}$$

4. Since 4/3 = 1.33, the average is greater than the median.

5. Students may also SUPPLY a number for x in order to create a more concrete equation:

   If Sam = 2 inches, then Lin = 3 inches and Ray = 5 inches. The median is 3 inches.

$$\frac{\text{sum}}{\text{\# of \#s}} = \text{average} \quad \rightarrow \quad \frac{2+3+5}{3} \quad \rightarrow \quad \frac{10}{3} \quad \rightarrow \quad 3.33 \quad \text{The average is greater.}$$

Question 4   Test 1, Second QR Section (version 2)
QA: Greatest prime factor of 1,000   QB: Greatest prime factor of 68
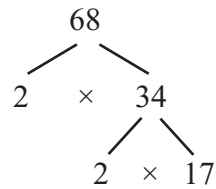*Arithmetic: Number Properties*   Answer: *Quantity B is greater*

1. Use prime factorization to find the greatest prime factor of 1000:

$$1000$$
$$2 \quad \times \quad 500$$
$$2 \quad \times \quad 250$$
$$2 \quad \times \quad 125$$
$$5 \quad \times \quad 25$$
$$5 \times 5$$
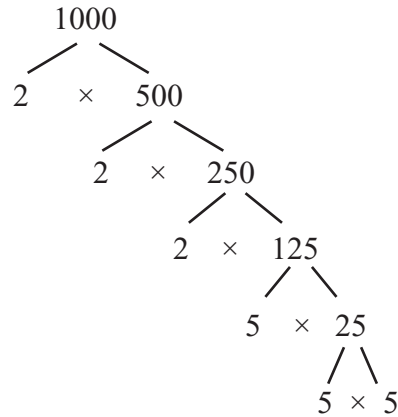
$1000 = 2 \times 2 \times 2 \times 5 \times 5 \times 5$ The greatest prime factor of 1000 is 5

2. Do the same with 68:

$$68$$
$$2 \quad \times \quad 34$$
$$2 \quad \times \quad 17$$

$68 = 2 \times 2 \times 17$ The greatest prime factor of 68 is 17. Quantity B is greater.

Question 5   Test 1, Second QR Section (version 2)
The probability that both events E....
QA: Probability that event E will occur   QB: 0.58
Probability   Answer: *The relationship cannot be determined*

1. A probability of 0.42 is the same as 42% or 42/100. The probability of two events occurring is the product of each individual event occurring:

$$\frac{E}{100} \times \frac{F}{100} = \frac{42}{100}$$

2. Can we make E greater than 58/100? Let's try to make a true math statement when $E = 0.90$:

$$\frac{90}{100} \times \frac{F}{100} = \frac{42}{100} \quad \rightarrow \quad 90F = 42 \quad \rightarrow \quad F = 0.467$$

   Sure! If there is a 90% chance of probability that E will occur, there is a 47% chance F will occur.

3. Can we make E less than 58/100?

$$\frac{50}{100} \times \frac{F}{100} = \frac{42}{100} \quad \rightarrow \quad 50F = 42 \quad \rightarrow \quad F = 0.84$$

   If there is a 50% chance of probability that E will occur, there is a 84% chance that F will occur.

4. Since we can make E both greater than and less than 0.58, it is impossible to determine the relationship on this question.

Question 6   Test 1, Second QR Section (version 2)
$x > 1$
QA: $x(x^2)^4$ QB: $(x^3)^3$
Algebra: Exponents   Answer: *The two quantities are equal*

1. If you know the rules of Exponents, you should be able to quickly simplify Quantities A and B:

   $$(x^n)^m = x^{(n)(m)}$$

   Quantity A: $x(x^2)^4 \quad \rightarrow \quad x(x^8) \quad \rightarrow \quad x^9$

   Quantity B: $(x^3)^3 \quad \rightarrow \quad x^9$

2. If you do not remember the rules of Exponents, you can solve this question by SUPPLYING a number for x (such as $x = 2$), but this solution will take more time and likely require a calculator.

Question 7 Test 1, Second QR Section (version 2)
***a* and *b* are positive....**

QA: $\dfrac{a}{b}$ **QB:** $\dfrac{a+3}{b+3}$

Algebra: Expression/Number Properties   Answer: *The relationship cannot be determined*

1. SUPPLY a set of numbers for *a* and *b* to determine the value of each quantity.

    If *a* = 1 and *b* = 2

    Quantity A = $\dfrac{a}{b}$ $\rightarrow$ $\dfrac{1}{2}$ or 0.5

    Quantity B = $\dfrac{a+3}{b+3}$ $\rightarrow$ $\dfrac{1+3}{2+3}$ $\rightarrow$ $\dfrac{4}{5}$ or 0.8   In this case, Quantity A is greater.

2. SUPPLY a second set of numbers for *a* and *b* to see if the result is the same.

    If *a* = 1 and *b* = 1

    Quantity A = $\dfrac{a}{b}$ $\rightarrow$ $\dfrac{1}{1}$ or 1

    Quantity B = $\dfrac{a+3}{b+3}$ $\rightarrow$ $\dfrac{1+3}{1+3}$ $\rightarrow$ $\dfrac{4}{4}$ or 1   In this case, the two quantities are equal.

3. Since we have two possible answers, the relationship cannot be determined from the information given.

Question 8 Test 1, Second QR Section (version 2)
A rectangular garden has a perimeter of 92 ....
Geometry: Quadrilaterals   Answer: *31*

1. Write an equation using the formula for the perimeter of a rectangle:

    width = *w*
    length (ℓ) = 1 foot greater than twice the width = 1 + 2*w*

    Perimeter of a rectangle = 2ℓ + 2*w*
    92 = 2(1 + 2*w*) + 2*w* $\rightarrow$ 92 = (2 + 4*w*) + 2*w* $\rightarrow$ 92 = 2 + 6*w* $\rightarrow$ 90 = 6*w* $\rightarrow$ 15 = *w*

2. Be careful! The most common wrong answer is 15! But this is the width, and the question asked for the length of the garden:

    length (ℓ) = 1 + 2*w* $\rightarrow$ 1 + 2(15) $\rightarrow$ 1 + 30 $\rightarrow$ 31

Question 9 Test 1, Second QR Section (version 2)
How many 2-digit positive integers...?
Arithmetic: Number Properties/Counting Problems   Answer: *Four*

1. First, find the factors of 24:

   1 and 24   2 and 12   3 and 8   4 and 6

2. Only the pairs (3 and 8) and (4 and 6) can make 2-digit positive integers:

   3 and 8: 38   83
   4 and 6: 46   64

3. There are four 2-digit positive integers whose product of the two digits is 24 (38, 46, 64, and 83).

Question 10 Test 1, Second QR Section (version 2)
If $(2x + 1)(x – 5) = ...?$

Algebra: Quadratic Equations   Answer: $-\dfrac{1}{3}$

1. FOIL the left side of the equation and expand the right side:

$$(2x + 1)(x – 5) = 2(x^2 – 1)$$
$$2x^2 – 10x + 1x – 5 = 2x^2 – 2$$
$$2x^2 – 9x – 5 = 2x^2 – 2$$

2. Then isolate x:

$$2x^2 – 9x – 5 = 2x^2 – 2$$
$$–9x – 5 = – 2$$
$$–9x = 3$$
$$x = -\frac{3}{9}$$
$$x = -\frac{1}{3}$$

Question 11   Test 1, Second QR Section (version 2)
At a certain fruit stand, the price of an apple is twice....
Algebra: Quadratic Equations
Answers: *(A) 2 apples and 16 oranges, (B) 3 apples and 14 oranges, and (D) 6 apples and 8 oranges*

1. SUPPLY a price for the apples and oranges:

    Orange = $1
    Apple = twice the price of an orange = $2

2. The price of 20 oranges would be $1 × 20 = $20.

3. Plug the SUPPLIED price of an apple and an orange into the answer choices to find all of the options that equal $20 (the price of 20 oranges).

    (A) 2 apples and 16 oranges
         2($2) + 16($1)   → $4 + $16   → $20   ✓
    (B) 3 apples and 14 oranges
         3($2) + 14($1)   → $6 + $14   → $20   ✓
    (C) 4 apples and 10 oranges
         4($2) + 10($1)   → $8 + $10   → $18   ✗
    (D) 6 apples and 8 oranges
         6($2) + 8($1)   → $12 + $8   → $20   ✓
    (E) 10 apples and 5 oranges
         10($2) + 5($1)   → $20 + $5   → $25   ✗
    (F) 12 apples and 4 oranges
         12($2) + 4($1)   → $24 + $4   → $28   ✗

Question 12   Test 1, Second QR Section (version 2)
A third-grade teacher has *n* boxes....

Algebra: Creating Expressions   Answer: $\dfrac{12n-t}{p}$

1. RECORD what you know:

> $12n$ = total pencils
> p = number of pencils per studnet
> t = leftover pencils
> ? = total number of students in the class

2. Some students may be able to conceptualize this problem to determine the expression that
    represents the number of students in the class. Others, however, may need concrete numbers to
    understand the problem. SUPPLY numbers to satisfy the terms:

> 24 total pencils $12n$ = total pencils (n = 2)
> 2 pencils per student p = number of pencils per studnet
> 4 leftover pencils t = leftover pencils
> 10 total students   ? = total number of students in the class

How would the first three numbers give us a total of 10 students?

> 10 students (2 pencils each) + 4 leftover pencils = 24 total pencils
>   ?   (p)   + t = $12n$

> $(?)(p) + t = 12n$
> $(?)(p) = 12n - t$
> $? = \dfrac{12n-t}{p}$

Question 13   Test 1, Second QR Section (version 2)
Judy drove 20 miles from her house....
Arithmetic: Rates   Answer: *7:46 pm*

1. Start with Judy:

> time = distance/rate
> Judy's time = 20 miles / 50 mph
> Judy's time = 0.4 hours
> Convert into minutes: 0.4 of 60 minutes = 0.4 × 60 = 24 minutes
> If Judy left home at 7:30 and the trip took her 24 minutes, she arrived at 7:54.

2. Now look at Greg:

> His journey was completed in 1/3 of Judy's time (24 minutes) → 1/3 × 24 = 8 minutes
> He arrived at the same time as Judy (7:54) → 7:54 – 0:08 = 7:46

Question 14   Test 1, Second QR Section (version 2)
STUDENT ENROLLMENT TABLES
Approximately what percent of the females...?
Data Analysis: Percents   Answer: *16%*

1. TRANSLATE:

(Approximately) <u>what percent</u> <u>of</u> <u>the females</u> <u>are</u> <u>juniors</u>?

$$\frac{x}{100} \qquad \times \qquad 540 \qquad = \qquad 88$$

$\dfrac{x}{100} \times 540 = 88$

$\dfrac{540x}{100} = 88$

$540x = 8800$

$x = 16.296\%$

2. Remember, the question used the word "approximately." The answer closest to 16.296% is 16%.

Question 15   Test 1, Second QR Section (version 2)
STUDENT ENROLLMENT TABLES
If 40 percent of the social science majors are females...?
Data Analysis: Percents   Answer: *252*

1. Since we are only given a percentage (30%) of the total enrollment (1400) that are social science majors, find the exact number:

30% of the total enrollment at social science majors
0.30×1400 = social science majors
420 = social science majors

2. If 40% of the social science majors are females, then 60% are males. Find the number of males:

60% of the social science majors are males
0.60×420 = males
252 = males

Question 16   Test 1, Second QR Section (version 2)
STUDENT ENROLLMENT TABLES
Students <u>not</u> majoring in humanities...?
Data Analysis: Percents   Answer: *67%*

1. If 33% of the students are Humanities majors, then 67% are NOT Humanities majors:

    100% – 33% = 67%

2. This relatively simple question tricks a lot of students into selecting the wrong answer. They look at the second table and see that Humanities makes up 33%, while Social Science is 30% and Physical Sciences are 24%. They add 30% and 24%, choose the first answer (54%) and move on. But they are wrong because Humanities + Social Sciences + Physical Sciences does not equal 100%:

    H + SS + PS
    33% + 30% + 24% = 87% of the total enrollment

    Thirteen percent of the total enrollment is not represented by the chart, and these enrollments are NOT Humanities majors!

Question 17   Test 1, Second QR Section (version 2)
If $x > 0$, then $(\sqrt{4}x +$....
Algebra: Exponents and Roots   Answer: *25x*

1. SUPPLY a number for *x* and plug it into the expression $(\sqrt{4}x + \sqrt{9}x)$:

    $x = 1$

    $$\left(\sqrt{4x} + \sqrt{9x}\right)^2 \quad \rightarrow \quad \left(\sqrt{4(1)} + \sqrt{9(1)}\right)^2 \quad \rightarrow \quad \left(\sqrt{4} + \sqrt{9}\right)^2 \quad \rightarrow \quad (2+3)^2 \quad \rightarrow \quad 5^2 \quad \rightarrow \quad 25$$

2. When $x = 1$, which answer choice equals 25? It should be obvious, but if not, run $x = 1$ through each answer choice.

    A) $5x$ $\rightarrow$ 5(1) $\rightarrow$ 5
    B) $6x$ $\rightarrow$ 6(1) $\rightarrow$ 6
    C) $13x$ $\rightarrow$ 13(1) $\rightarrow$ 13
    D) $25x$ $\rightarrow$ 25(1) $\rightarrow$ 25 ✓
    E) $30x$ $\rightarrow$ 30(1) $\rightarrow$ 30

Question 18 Test 1, Second QR Section (version 2)
Which of the following points are on the graphs of...?
Coordinate Geometry: Equation of a line   Answer: *(−1, 1) and (2,4)*

1. Run each coordinate pair in the answer choices through both equations. If both equations are
    true, then the answer choice satisfies the question:

$$y = x + 2 \qquad\qquad\qquad y = x^2$$

(−2, 0): $0 = -2 + 2 \;\rightarrow\; 0 = 0$ ✓ $0 = -2^2 \;\rightarrow\; 0 \neq 4$ ✗

(−1, 1): $1 = -1 + 2 \;\rightarrow\; 1 = 1$ ✓ $1 = -1^2 \;\rightarrow\; 1 = 1$ ✓

(0, 2): $2 = 0 + 2 \;\rightarrow\; 2 = 2$ ✓ $2 = 0^2 \;\rightarrow\; 2 \neq 0$ ✗

(1, 1): $1 = 1 + 2 \;\rightarrow\; 1 \neq 3$ ✗   Do not need to check second equation.

(2, 4): $4 = 2 + 2 \;\rightarrow\; 4 = 4$ ✓ $4 = 2^2 \;\rightarrow\; 4 = 4$ ✓

Only the second and last coordinate pair satisfy both equations.

Question 19 Test 1, Second QR Section (version 2)
If *x* is an integer, which of the following...?
Algebra: Number Properties   Answer: $x^2 + 3x + 8$

1. SUPPLY $x = 1$ and plug it into each answer choice:

A) $x^2 - x - 1 \;\rightarrow\; 1^2 - 1 - 1 \;\rightarrow\; 1 - 1 - 1 \;\rightarrow\; -1$ Odd

B) $x^2 - 4x + 6 \;\rightarrow\; 1^2 - 4(1) + 6 \;\rightarrow\; 1 - 4 + 6 \;\rightarrow\; 3$ Odd

C) $x^2 - 5x + 5 \;\rightarrow\; 1^2 - 5(1) + 5 \;\rightarrow\; 1 - 5 + 5 \;\rightarrow\; 1$ Odd

D) $x^2 + 3x + 8 \;\rightarrow\; 1^2 + 3(1) + 8 \;\rightarrow\; 1 + 3 + 8 \;\rightarrow\; 12$ ✓

E) $x^2 + 2x + 10 \;\rightarrow\; 1^2 + 2(1) + 10 \;\rightarrow\; 1 + 2 + 10 \;\rightarrow\; 13$ Odd

Question 20   Test 1, Second QR Section (version 2)
The average (arithmetic mean) of the 11 numbers in a list....?
Statistics: Averages   Answer: *36.5*

1. The secret to so many Average questions on the GRE is the sum, and this question is no different. Start by finding the sum of the list of 14 numbers:

$$\frac{sum}{\text{\# of \#s}} = average \quad \rightarrow \quad \frac{sum}{11} = 14 \quad \rightarrow \quad sum = 154$$

2. Find the sum of the list of 9 numbers:

$$\frac{sum}{\text{\# of \#s}} = average \quad \rightarrow \quad \frac{sum}{9} = 9 \quad \rightarrow \quad sum = 81$$

3. Let's consider "the other 2 numbers." If we subtract the sum of the 9 numbers from the sum of the 14 numbers, we have the sum of the other 2 numbers:

    $154 - 81 = 73$

4. Now we can find the average of the other 2 numbers:

$$\frac{sum}{\text{\# of \#s}} = average \quad \rightarrow \quad \frac{73}{2} = average \quad \rightarrow \quad 36.5 = average$$