GRE

Quant Reasoning Assessment

Geometry, Coordinate Geometry

Answer Explanations
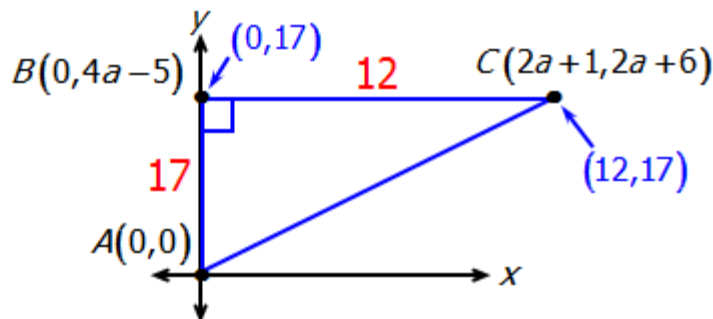
1. **Answer and Analysis**

    The correct response is (E). Let x equal the degree measure of the smaller angle, and (x + 30) equal the degree measure of the larger angle. The key to this question is that the other two angles of the parallelogram are the same as these two, and that the degree-measure total of all four angles is 360:

    $$x + x + (x + 30) + (x + 30) = 360$$
    $$4x + 60 = 360$$
    $$4x = 300$$
    $$x = 75$$

2. **Answer and Explanation**

    The points $A(0,0)$, $B(0,4a-5)$ and $C(2a+1,2a+6)$ form a triangle. If $\angle ABC = 90°$, what is the area of triangle ABC?

    (A) 102
    (B) 120
    (C) 132
    (D) 144
    (E) 156

    $B(0,4a-5)$ $(0,17)$ 12 $C(2a+1,2a+6)$

    17 $(12,17)$

    $A(0,0)$

    $$4a-5 = 2a+6$$
    $$2a-5 = 6$$
    $$2a = 11$$
    $$a = 5.5$$

    $$\text{Area} = \frac{\text{base} \times \text{height}}{2}$$
    $$= \frac{12 \times 17}{2}$$
    $$= 102$$

3. **The correct choice is (D) and the correct answer is 20.5.**

    Explanatory Answer

    From the measure of the length of the sides of the triangle, 9, 40 and 41 we can infer that the triangle is a right angled triangle. 9-40-41 is a Pythagorean triplet.

    In a right angled triangle, the radius of the circle that circumscribes the triangle is half the hypotenuse.

    In the given triangle, the hypotenuse = 41.

    Therefore, the radius of the circle that circumscribes the triangle = $\frac{41}{2}$ = 20.5 units.

4. **Correct Answer:** A
   Explanation:
   If you double the sides of a cube, the ratio of the surface areas of the old and new cubes will be 1: 4. The ratio of the volumes of the old and new cubes will be 1: 8.
   Weight is proportional to volume. So, If the first weighs 6 pounds, the second weighs 6x8 pounds =48.

5. **Answer and Analysis**

   The correct response is (B). The volume of the cylindrical tank is $(h)(\pi r^2)$, where h is the cylinder's height and r is its radius:

   $V = (h)(\pi r^2) = (3)(4)\pi = 12\pi$
   The value of π is given as approximately 3.14. Accordingly, the large tank's volume is between 37 and 38 cubic meters. With a volume of 3 cubic meters each, 13 smaller tanks of water are needed to fill the larger tank in its entirety. (12 tanks of water amount to 36 cubic meters, which is not enough.)

6. **Correct Answer:** ABDE
   Explanation:
   The fence will consist of one more post than there are chains. (e.g. P-c-P-c-P). Therefore, a total length has to be a multiple of the length of the chain plus one post (5.5) plus one post extra. We have length = (5.5n + 0.5), where n can be any positive whole number. If n= 3, length =17; if n= 5, length = 28, etc. but there is no whole number that can give 35. Hence all the answers except C are correct.

7. **Answer and Analysis**

   The correct response is (D). Angles x and w are "vertical," which means that they are opposite each other across the intersection of two lines. Vertical angles are always equal in size; thus, x = y, and the problem boils down to comparing y and z. The centered information tells us that y + z = 130, but this information is not sufficient to determine which angle, if either, is larger than the other.

8. **Correct Answer:** C
   Explanation:
   Draw the diagram. The diagonal of the rectangle is the diameter of the circle. The diagonal is the hypotenuse of a 3,4,5 triangle, and is therefore, 5.
   Circumference = π. diameter = 5π

9. **Correct Answer:** D
   Explanation:
   If the diameter of the old lid is 100, the diameter of the new lid will be 150.
   This gives a ratio of 2 : 3

The areas of the lids will be in the ratio $(2)^2 : (3)^2$. or 4 : 9
This represents an increase in area of 5units for every 4 units
5/4 is equivalent to 125 percent.

10. **Correct Answer:** D
    Explanation:
    (Total area of square - sum of the areas of triangles ADE and DCF) will give the area of the quadrilateral
    9 - (2 x ½ x 3 x 1.5) = 4.5

11. *Correct Answer is: D 1% decrease. Take the original length and breath to be 100 and 100.*

12. *Correct Answer is : D Data Inadequate*

13. If the area of the right triangle above is 72, what is the value of x?

    Correct Answer: 45
    Explanation:
    Area of a triangle is ½ base x height. ½ x b x 12 =72
    Therefore base = 12
    This means this is an isosceles right triangle and x =45

14. In the figure above, AD = AC = CB.
    If the value of y is 28, what is the value of x?

    Correct Answer: 84
    Explanation:
    In triangle ABC angles CAB and CBA are equal (isosceles triangle). And both are 28.
    Angle ACD = 56 (exterior angle = sum of two opp. interior angles)
    Angles ACD and CDA are equal (isosceles triangle)
    Angle DAC = 180 - 112 = 68
    The angle marked x = 180 - 68 - 28 = 84

15. Two dials O and P have pointers that start from the vertical position as shown. Pointer O rotates anticlockwise at a rate of 5 degrees per second and pointer P rotates clockwise at 9 degrees per second. How many complete revolutions will P have made when O completes 335 complete revolutions?

    Correct Answer: 603
    Explanation:
    When O completes 335 revolutions it will have turned through 335 x 360 degrees.
    At a rate of 5 degrees per second this means 335x 360 /5 seconds
    P will have turned through 9 x 335 x 360 /5 degrees in the same time
    Now divide by 360 to get complete revolutions = 9 x 335 / 5 = 603

16. Correct answer: 972 sq units

1458 units/2 cubes= 729 units/cube
(They're identical)

Extract the cube root of 729
=9 units/side

Get the surface area of one cube

$6*a^2$
9*9*6= 486 sq. units

multiply by two to get TOTAL surface area
972 sq. units

17. Correct Answer: D. the two triangles ABE and CDE are similar

18. Correct Answer: C – divide the volumes. H = $3 * 10^3$ /pi r^2

19. Correct Answer: C – x + x + x + 52 + x+ 52 = 360 gives 4x = 360-104 = 256, x = 64

20. Correct Answer: D
Explanation:
Since the angles of BCD are all equal, it is an equilateral triangle. Therefore. Since one side is 2, BD and CD are also 2. These sides (totaling 4 units) represent half the perimeter of the parallelogram. Total perimeter = 8.

21. Correct Answer: C
Explanation:
When the larger cube is cut into smaller cubes, the corner cubes will have paint on three sides. The cubes in the middle of the faces will have paint on only one side, but the cubes cut from the edges will have paint on two sides. In this case, there will be only one cube one each edge (excluding the corners), and since there are 12 edges, there will be 12 cubes with paint on two sides. (Drawing a diagram will make this much clearer.)

22. Correct Answer: D
Explanation:
If the area of the circle is $4a^2\pi$, the radius will be the square root of 4a2 (i.e. 2a)
The diameter will be 4a. The diameter is also the side of the square. Area of the square is
$(4a)2 = 16a^2$

23. Correct Answer: B
Explanation:
The measure of the third side of a triangle must lie between the sum and the difference of the other two sides. Using this fact along with the answer choices, we can eliminate the wrong answers.
(A) cannot be correct because 4 would not be the longest side.(sides 4, 5, and 4)
(B) could be correct because the other two sides would be 3 and 4.

(C) cannot be correct because this third side would be greater than the sum of the other two sides

24. **Correct Answer:** E
Explanation:
If a value x is selected for angle ACB and one quarter of the value is taken for angle BAC, we could work out the value for the other angle of the triangle. Also angle ACD would be 180 - x. The problem is that we could choose a range of different values for x and still make them fit the given information. Therefore we cannot work out any one value for angle ACD.

25. **Correct Answer:** B
Explanation:
The slope is the y side of the triangle divided by the x side of the triangle (y2 - y1) / (x2 - x1) This is a / 3a which is the equivalent of 1/3 but the slope is negative (because the line slopes down from left to right as we look at it). Hence -1/3

26. **Correct Answer:** C
Explanation:
If the radii of the two circle are in the ratio 1 : 3, then the areas of the circle will be in the ratio (1)2 : (3)2which is 1 : 9
The marked areas represent equivalent fractions of the areas since the angles at the centers are the same. Hence the areas of the shaded parts are also in the ratio 1 : 9.
If the area of the smaller is 2, then the area of the larger will be 18.

27. **Correct Answer:** B
28. **Correct Answer:** 60
Explanation:
Let the smallest angle = x
The sum of two vertically opposite angles = 2x
The sum of the other pair of vertically opposite angles = 360 - 2x
But since they are double the measure of angle x their sum also = 4x
Equating gives 360 - 2x = 4x; 360 = 6x; 60 = x
[Or even simpler: the sum of one angle and its neighbor =180. The angles are x and 2x, so 3x = 180 ; x = 60]

29. **Correct Answer:** 7
Explanation:
The area of the shaded region is the area of the large triangle enclosed between the axes minus the area of the small un-shaded triangle.
8 - 1 = 7

30. **Correct Answer:** 8
Explanation:
The number of small cubes will be the volume of the large cube divided by the volume of the small cube.
To find the volume of the large cube, divide the surface area by 6, then take the square root of the result: this will give the side of the cube, which can then be cubed to give the

volume.

96/6 = 16; side = 4; volume = 4 x 4 x 4

Now divide by the small cube volume (8). The number of cubes is 8.

31. **Correct Answer:** 2
Explanation:

AC is the diagonal of a square with side = diameter of a circle (sum of two radii).

The diagonal can be calculated if you take the side of the square as x, then the diagonal will be x √2. (Because the diagonal is the hypotenuse of a 45-45-90 triangle).

In this case the side = √2, and the diagonal = √2 x √2 = 2

32. **Correct Answer:** C
Explanation:

Imagine a third parallel line drawn through C. The angle ACD will be made of two angles, one alternate to BAC, and therefore = 30. The other is alternate to CDE and therefore = 50. Total for angle ACD = 80

33. **Correct Answer:** B
Explanation:

Surface area of one small brick = 6; total number of bricks = 12; total surface when disassembled = 6 x 12 = 72

Surface of whole big block= area of four larger faces + area of the two smaller faces = (4 x 6) + (2 x 4) = 24 + 8 = 32

the increase is 40 units

34. **Correct Answer:** 6
Explanation:

x + (x + 1) + (x + 2) = 12

3x + 3 = 12; 3x = 9; x = 3

The sides are 3-4-5

The area = ½ x 4 x 3 = 6

a = ½ x 4 x 3 = 6

35. **Correct Answer:** 30
Explanation:

To make the rectangular box you will need two of each of the above shapes.

Then, Volume = length x breadth x height = 5 x 2 x 3 = 30

36. **Correct Answer:** 3
Explanation:

From the x-coordinates of points A and D we can work out the length of AD (2). Since BC will also be 2 we can find CD ½ (perimeter – AD + BC) =3

Hence the coordinates of point C are 1,3

Now we can find the value of w by substituting x = 1 and y = 3 in the equation $y = wx^2$; 3 = w.1; w = 3

37. Correct Answer: A
Explanation:
The big triangle ABC is similar to the small triangle ADE because their bases are parallel. If corresponding side of two similar triangles are known the ratio of the areas is also known. In this case, let AD be one unit, then AB is 2 units (given that AB = AD + DB). The ratios of the sides is 1 : 2. The ratio of the areas will be $(1)^2 : (2)^2$; 1 : 4
Since the big triangle has area 40, using the ratio, the small has area 10.

38. Correct Answer: C
Explanation:
The total perimeter of the un-shaded part is made up of three sides of the rectangle and the perimeter of the half-circle.
The area of a half circle = $\frac{1}{2} \pi r^2$
$8\pi = \frac{1}{2} \pi r^2$; therefore r = 4
The perimeter of the half circle is $\frac{1}{2} 8\pi = 4\pi$
The diameter of the circle (8) = the length of the rectangle.
Total perimeter of the rectangle = 26
Three sides measure 26 - 8 = 18   Ans. $18 + 4\pi$

39. Correct Answer: 144
Explanation:
If the side of one small cube is 6, the surface area = 6×6^2
since there are three of these cubes their total surface area = $3 \times 6 \times 6^2$
the rectangular box will have sides will lose surface area equivalent to the four faces that get glued together to form a line of cubes.
The 'lost' surface = 4×6^2, and so the rectangle is that much less in surface area = 144

40. Correct Answer: C

ED = 3, DC = 4 and we need to determine EC in order to find the perimeter of triangle EDC.
We apply the Pythagorean theorem:
$EC^2 = ED^2 + DC^2$.
$EC^2 = 9 + 16$.
$EC = 5$.
The perimeter of triangle EDC is 5 + 4 + 3 = 12.

41. Correct Answer: C

Answer: The equation of a line with intercept -2 is:
y = -2x + n.
If the line passes through point (3,2), 2 = (-2)3 + n, and n = 8.
The equation of the line is y = -2x + 8 and the y-intercept is 8.

42. Answer: B

From the picture, we can see that figure ABCD is a quadrilateral but doesn't fit into a form like rectangle, parallelogram, etc... We will have to take the area of triangle ABE and subtract from it the area of triangle CDE, this will leave us with figure ABCD.

Lets look at triangle ABE first. The area of a triangle is ½ (base)(height). So we need to know the base and the height of this triangle. Since it is a right triangle, the base and height are going to be the lengths of the two legs, which are sides AB and AE.

Side AB can be found by taking the absolute value of the difference of the y values of their ordered pairs, which would be 12 - 0 = 12.

Side AE can be found by taking the absolute value of the difference of the x values of their ordered pairs, which would be 6 - 0 = 6.

Plugging 6 in for the base and 12 in for the height into the formula for the area of a triangle we get:

$$A = \left(\frac{1}{2}\right)(base)(height)$$

$$A = \left(\frac{1}{2}\right)(6)(12)$$

$$= 36$$

The area of triangle ABE is 36.

Now lets look at triangle CDE. The area of a triangle is ½ (base)(height). So we need to know the base and the height of this triangle. The base of this triangle is side DE. The height can be found by making a perpendicular line from C to the base.

Side DE can be found by taking the absolute value of the difference of the x values of their ordered pairs, which would be 6 - 3 = 3.

The height can be found by taking the absolute value of the difference of the y value of C and 0 (the y value on the base), which would be 4 - 0 = 4.

Plugging 3 in for the base and 4 in for the height into the formula for the area of a triangle we get:

$$A = \left(\frac{1}{2}\right)(base)(height)$$

$$A = \left(\frac{1}{2}\right)(3)(4)$$

$$= 6$$

The area of triangle CDE is 6.

Last, we need to **take the difference of the areas of the two triangles:**

$$36 - 6 = 30$$

The area of the figure ABCD is 30.

43. Answer: D

Since 4 angles of measure *a* make up *XY* and *XY* is a line segment that means, the 4 *a* angles would have to make up 180 degrees.

Similarly, the 3 *b* angles would be 180 degrees.

This would give us enough information to find out what *a* and *b* are equal to.

Lets start with *a*:

$a + a + a + a = 180$ ***The 4 *a* angles = 180 degrees**

$4a = 180$

$\dfrac{4a}{4} = \dfrac{180}{4}$ ***Divide BOTH sides by 4**

$a = 45$

Next lets look at *b*:

$b + b + b = 180$ ***The 3 *b* angles = 180 degrees**

$3b = 180$

$\dfrac{3b}{3} = \dfrac{180}{3}$ ***Divide BOTH sides by 3**

$b = 60$

Putting those values in for *a* and *b* we get:

$\dfrac{a + b}{a - b} =$

$\dfrac{45 + 60}{45 - 60} =$ ***Plug in 45 for *a* and 60 for *b***

$\dfrac{105}{-15} =$

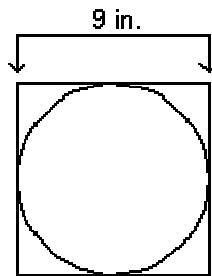-7

Our answer to this problem is -7.

44. Answer: D

Ultimately, we need to find the area of the circle. That means we need the **area of a circle formula which is**

$$A = \Pi \ (radius)^2$$

Since we were not given the radius of the circle, it looks like we will have to go out and find it.

Since the area of a square is found by taking the side squared, this means the side of our square is going to be 9 inches, since its area is 81 square inches.

Let's look at a visual of this:

9 in.

It looks like the side of the square is also the diameter of the circle. Since the diameter is 9, the radius, which is half of the diameter, is going to be 9/2 or 4.5.

Putting the radius into the area formula we get:
$$A = \Pi \ (radius)^2$$
                    ***Plugging in 4.5 for the radius**

$$A = \Pi \ (4.5)^2 =$$
$$20.25\Pi$$

The area of the circle is 20.25 *pi* square inches.

45. **Answer: C**

First, let's find the volume of each cylindrical tank. **The volume of a cylindrical tank is**

$V = \Pi \,(radius)^2(height) = \Pi \, r^2 h$

Filling in 10 for radius and 20 for height we get:

$V = \Pi \, r^2 h$

$V = \Pi \,(10)^2(20) =$

2000Π

Next we want to consider the fact that we have two tanks. **Multiplying the volume by two we get:**

$2V = (2)(2000\Pi) =$

4000Π

Next we want to consider that there are about 7.5 gallons in a cubic foot of water. **Multiplying the volume of the two cylinders by 7.5 we get:**

$4000 \, \Pi \,(7.5) = 30000\Pi$

Next notice that none of the answers has the pi symbol in them. **That means we will have to put in 3.14 for *pi* and see what we get:**

$30000\,(3.14) = 94200$

94,200 gallons of water can be treated at the water plant at one time.

46. **Answer: C**

Lets see what the information that was given to us means. If ABC is an equilateral triangle, that means all three sides are equal and all three angles have the same measurement. That means, angles 1, 2, and 3 are each 60 degrees. The reason for that is the degrees of all three angles of any triangle sum up to be 180 degrees. If all three angels are the same, then they would each have to be 60 degrees, because 60 + 60 + 60 = 180.

Now we have a value to work with.

We have to work our way to angle 5.

Next, we can use the fact that lines BC and DE are parallel to each other and ray AE is a transversal that intersects these two lines. This means angles 3 and 4 are equal to each other because they are corresponding angles. So this means angle 4 is also 60 degrees. We are getting closer.

Note how angles 4 and 5 together make a straight angle. This means their sum is 180 degrees. Well if angle 4 is 60 degrees, this means angle 5 must equal 180 - 60 = 120 degrees.

Angle 5 is 120 degrees.

47. **Answer: B**

The slope can be found by using rise/run. I prefer to go left to right. I'm going to start with the point that is on the x-axis, which is (-4, 0) and then step up to the point that is on the y-axis (0, 2). If we do that, we rise up 2 and go over to the right 4.

So the slope is rise/run which is 2/4 = 1/2.

The *y*-intercept is the point where the graph crosses the *y*-axis. In this case that is (0, 2). The *y*-value of that point is 2.

This means the *y* value of the *y*-intercept of the graph is greater than the slope of the line.

48. <u>Correct Ans : c</u>

Explanation:
The average of three numbers is their sum divided by 3. Since in any triangle the sum of the measures of the three angles is 180 degree, the average in each column to 180/3 = 60. Pick values of the measures of the angles. For example in isosceles triangle ABC, Choose 70, 70, 40 in right triangle XYZ, Choose 30, 60, 90. Each average is 60; therefore the answer would be (c).

49. <u>Correct Ans : B</u>

Explanation:
Do not calculate the two areas instead compare them. The circle in column 1 has a radius of 17 and so its diameter is 34. Since the circle in column 2 has a larger diameter, its area is greater

50. **Correct Ans :** C

Explanation:
If each edge is 6 the area of each face is 6*6 = 36, and since a cube has six faces, the total surface area is 6*36 = 216. The volume is 6 cube = 216. So the columns could be equal to 216. So the columns could be equal. Eliminate the option (a) and (b). If you have sense that this is the only cube with this property. Therefore the option would be (c).

51. <u>Correct Ans : A</u>

Explanation:
Calculate both the areas.
Column A: $A = s^2 = 4^2 = 16$.
Column B: $A = s^2 \sqrt{3}/4 = 4^2 \sqrt{3}/4 = 4\sqrt{3}$ and twice A is $8\sqrt{3}$. Since $\sqrt{3} = 1.7$, $8\sqrt{3} = 13.6$

52. **Correct Answer: D**
Explanation:
Number of diagonals= C(9,2) – 9 =9! | (9-2)!2! |
=9!/(7!2!)=9*8/2=9*4=27

53. *.Correct Answer is C:120°*

54. *.Correct Answer is B :7.07 m*