1) The miller and his daughter live in a humble house made with a cube as the base and square pyramid as the roof. The cube has a side length of 4 ft, while the house has a total height of 8 ft. Assuming the pyramid fits snuggly on the cube, what is the volume of the house? Disregard the impracticality of the size of the house.

**A) 64 B) C) D) 128 E) NOTA**

2) The miller’s daughter possesses two items of value. One of which is a ring. If the shape of the ring is an annulus and a chord of the larger circle that is tangent to the smaller circle is 12 mm, what is the area of the annulus?

**A) 36π B) 64π C) 100π D) 144π E) NOTA**

3) Her second treasure is a gem-encrusted necklace. This gem is a polyhedron with 30 edges and 20 vertices. What is this polyhedron called?

**A) Tetrahedron B) Hexahedron C) Octahedron D) Dodecahedron**

**E) NOTA**

4) Given this conditional statement: If the daughter can spin straw into gold, then she will marry the king. Let the hypothesis be p and the conclusion be q. What is the correct notation for the contrapositive of this statement?

**A) B) C) D) E) NOTA**

For questions 5-7, refer to the information below: Rumpelstiltskin’s secret to spinning straw into gold is that he uses a very special loom. It is a prism with a regular 50-gon as a base. Each side of the 50-gon is 1 ft.

5) Which answer choice approximates the area of the 50-gon closest?

**A) B) C) D) E) NOTA**

6) If the 50-gon is also referred to as polygon , then what is the measure of in degrees?

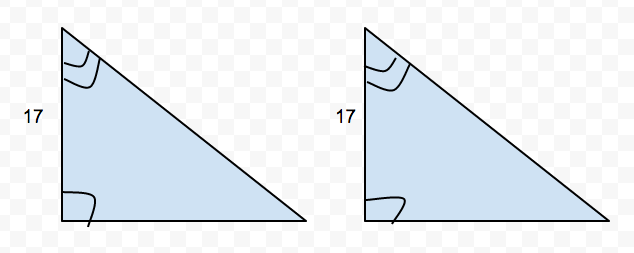
**A) 72 B) 84 C) 96 D) 108 E) NOTA**

7) How many diagonals does this 50-gon have?

**A) 1150 B) 1175 C) 1200 D) 1225 E) NOTA**

8) The straw the king provides is very special. Each strand has infinite length and is completely rigid. The daughter, while waiting for Rumpelstiltskin to finish weaving gold, starts tossing the straw in the air. She tosses 10 strands and sees that when the strands land, the strands all intersect each other in some way. What is the maximum number of intersections possible?

**A) 35 B) 40 C) 45 D) 50 E) NOTA**

9) The king tells the daughter that if she is not able to meet his demands its “off with her head!” The king has a very special guillotine shaped like a triangle. His brother, who rules a different kingdom, has the same exact guillotine. What a coincidence! The two triangles are shown below. Which triangle congruence theorem shows they are congruent?

**A) ASA B) AAS C) SAS D) SSA E) NOTA**

10) Speaking of brothers, Rumpelstiltskin has a brother named Nikstlitslepmur. Interestingly enough, his magic allows him to unweave gold back into straw. If it takes Rumpelstiltskin 4 hours to completely weave a room of straw into gold and it takes 8 hours for Nikstlitslepmur to unweave a room of gold into straw, then how many hours will it take for a room full of straw to turn completely into gold assuming both Rumpelstiltskin and Nikstlitslepmur are working the entire time?

**A) 2 B) 4 C) 6 D) 8 E) NOTA**

11) In order to make sure the daughter does not escape, the king leaves his trusty guard dog outside of the tower she is working in. The base of the tower is a regular pentagon with side length of 8 ft. The dog is tied to a post on a vertex of the pentagon with a 10 ft rope. Assuming the dog cannot go inside the tower and can only roam within the boundaries of the rope, what is the area the dog can roam? *Both the rope and the dog have negligible size.*

**A) B) C) D) E) NOTA**

12) As Rumpelstiltskin was weaving straw into gold, he stumbles upon a particular strand of straw. This strand is not only indestructible, but also elastic. He keeps this strand to himself and makes a slingshot. He ties two ends of the slingshot at points (2,5) and (10, 11). In order for the slingshot to work, an obtuse angle must be made. What is the area of the space Rumpelstiltskin’s hand can be in when operating this slingshot? *Assume the straw is always taut.*

**A) B) C) D) E) NOTA**

13) The tower where Rumpelstiltskin is weaving is 35 ft tall. 70 ft away, lies Rapunzel’s tower which is 50 ft tall. If the miller’s daughter uses straw to connect the top of Rumpelstiltskin’s tower with the base of Rapunzel’s tower and Rapunzel uses her hair to connect the top of her tower to the base of Rumpelstiltskin’s tower, then how high off the ground does Rapunzel’s hair and the straw meet?

1. **B) C) D) E) NOTA**

14) On the third day, the king decrees the straw must be woven to gold by 11:59. Curious, the miller’s daughter decides to calculate the acute angle made by the clock’s hands. In how many seconds will the clock’s hand make the same angle?

**A) 110 B) 115 C) 120 D) 125 E) NOTA**

15) The miller’s daughter is worried that Rumpelstiltskin will not make the gold on time. It bothers her so much she can’t sleep at night. A trick her father taught her to deal with such a problem is to count primes. However, her brain is so frazzled that she has problems doing so. Which of the 4 numbers she listed is actually prime?

**A) 33 B) 51 C) 87 D) 91 E) NOTA**

16) The King is quite satisfied with the miller’s daughter and has agreed to marry her. When choosing her wedding gown, the daughter has a very particular preference; the gown must be completely made of one type of regular polygon. Which regular polygon below does not suit the job? *Hint: The gown must not have any holes.*

**A) Triangle B) Quadrilateral C) Pentagon D) Hexagon E) NOTA**

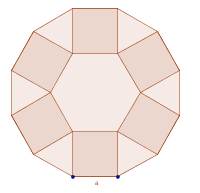
17) Raised in a poor socioeconomic background, the miller’s daughter had no female friends and is troubled by the notion of not having a bridesmaid. But have no fear, Sampath, the bridesmaid for hire, is here. By paying the low low price of FREE.99, he satisfies all of your bridesmaid needs. If the bouquet he provides is shaped like a cone with radius of 5 and height of 12, then what is the surface area of the cone.

**A) B) C) D) E) NOTA**

18) Now it is time for the King and the miller’s daughter to exchange wedding vows. The priest bestows them a conditional statement: “If the king loves the daughter, then he will marry her”. The priest then asks the truth-value of the statement. The king confidently answers the statement to be true. To the untrained eye, it seems the king is professing his love, but in actuality, he does not love her. He only loves money. However the king is not wrong in his claim. Why is the king correct?

1. **A false hypothesis results in a true conditional statement.**
2. **A true conclusion results in a true conditional statement.**
3. **If the hypothesis and conclusion have opposing truth values, then the conditional statement is true.**
4. **None of these, but this is still a better love story than Twilight.**
5. **NOTA**

19) The daughter, or should I say, the queen is currently getting accustomed to the palace. She notices the floor has an interesting design consisting of 6 triangles, 6 squares, and 6 hexagons, all with equivalent side lengths. This shape is also a regular dodecagon. Given this information, what is the area of a regular dodecagon with side length of 3?

****

**A) B)**

**C) D)**

**E) NOTA**

20) While waiting for the first born child of the queen, Rumpelstiltskin did many side jobs to pass his boredom. He was an active street performer and his favorite activity was juggling. However, instead of juggling fruits or balls, Rumpelstiltskin juggled numbers. He was so adept that he could even juggle numbers in his head! He was asked to find the sum of the first 10 perfect cubes. What answer did he obtain?

**A) 385 B) 1000 C) 2025 D) 3025 E) NOTA**

21) Remember Nikstlitslepmur? Well he also is a street performer. His specialty is magic tricks. He has a box in the shape of a rectangular prism where he will get his assistant to crawl inside. Then he will stick swords through all of the box’s space diagonals and hope the assistant makes it out okay. How many swords will he need?

**A) 2 B) 4 C) 6 D) 8 E) NOTA**

22) Curious if his sword is long enough, Nikstlitslepmur decides to calculate how long each space diagonal is. He knows the sum of the length, width, and height of the prism to be 25. He also knows the surface area and the volume to be 125 and 100 respectively. What is the length of the space diagonal?

**A) 15 B) 20 C) 25 D) 30 E) NOTA**

23) Rumpelstiltskin also likes origami. He takes a 12 by 18 piece of paper and creases its diagonal. What is the area of the shape formed? *Hint: Fold scratch paper to experiment if you are having trouble.*

**A) 108 B) 120 C) 138 D) 216 E) NOTA**

24) After the marriage of his daughter, the miller decides to move up in life. He decides to raise livestock. First he must fence off a plot of his land and asks Nilay for help. Nilay’s fencing company, Nilay’s Fencing Inc., has agreed to provide materials, but it is up to the miller to come up with the design. If the miller wants to maximize area with given length of fencing, then what shape should he use?

**A) Square B) Rectangle C) Rhombus D) Kite E) NOTA**

25) The queen has never has the luxury of being rich before. Hence, she decides that today will be the day where she shops till she drops. She prioritizes Michael’s Mall as a “must go” location, but she may consider Katherine’s Kitchen or Sarah’s Salon as detours before heading to the mall. She has enough time for only two locations. She realizes if she takes either route, the distance she travels will always be longer than the distance she would have traveled if she directly went to the mall. Which choice below best represents this phenomenon? *Her starting location is always the Royal Palace*

**A) Triangle Inequality Theorem B) Distance Formula**

**C) Segment Addition Postulate D) Law of Cosine**

**E) NOTA**

26) One night, Rumpelstiltskin placed a bet against Nikstlitslepmur. Two fair six-sided dice are thrown. For Rumpelstiltskin to win, he must roll a sum of 4 or higher if the queen’s first-born child is a boy or roll a sum of 8 or lower if the child is a girl. What are the chances of Nikstlitslepmur winning? *A boy is as likely as a girl.*

1. **B) C) D) E) NOTA**

27) Rumpelstiltskin has come to collect his dues. The queen must guess his name within three days or else she will have to give up her child. Not willing to give up without a fight, she sends the entire kingdom a message: If thou shall acquire this imp’s name, thou shall be rewarded, fortune and fame. The money she is handing out as reward is funded from an unused plot of land. If this plot of land is in the shape of a triangle with side lengths of 13, 14, and 15, and the market value of land goes for 72 gold pieces per square unit, then how much reward money, in gold pieces, is the queen offering?

**A) 2048 B) 3024 C) 4096 D) 6048 E) NOTA**

28) Justin the Peasant is adamant on obtaining the reward money. He stumbles upon the woods Rumpelstiltskin lives in. In no time at all, Justin is completely lost. In order to find Rumpelstiltskin, he travels 20 ft west, 15 ft south, 3 ft west, 12 ft north, 4 ft south, 7 ft east, 2 ft south, and 24 ft west. If Justin were a normal human being with a sense of direction, he would’ve taken the direct route. How many feet less would he have walked?

**A) 41 B) 46 C) 49 D) 87 E) NOTA**

29) After learning of Rumpelstiltskin’s name, the queen decided she should choose an odd name for her child. She settles on the name “Todd” as it has the word “odd” in it and ironically is spelled with 4 letters, an even amount. How many 3-digit perfect squares have an odd number of even-digits and even number of odd-digits? For example: “121” has this property since it has two odd-numbered digits, 1 and 1, and one even-numbered digit, 2.

**A) 8 B) 9 C) 10 D) 11 E) NOTA**

30) Now you all know the story. The queen guesses correctly and keeps her child. Rumpelstiltskin disappears in a puff of smoke. What you don’t know is that Rumpelstiltskin transferred himself to the nth dimension to write this test in order to vent. During his stay, the most he could recognize was length and width. However, he paid no attention to this fact because this was his (the test writer’s) favorite dimension. What is n? *Hint: Anyone an anime fan?*

**A) 0 B) 1 C) 2 D) 3 E) NOTA**