



SECONDARY 1 (GRADE 7) 2021 CONTEST PAPER

NAME: _____

Index Number: _____

SCHOOL: _____

INSTRUCTIONS:

1. Please **DO NOT OPEN** the contest booklet until the Proctor has given permission to start
2. TIME: **1 hour 30 minutes**.
3. There are 25 questions with 100 total points:
Section A: Questions 1 to 15 score 3 points each, no points are deducted for an unanswered or wrong answer.
Section B: Questions 16 to 25 score 5 points each, no points are deducted for an unanswered or wrong answer.
Section C: Questions 21 to 25 score 6 points each, no points are deducted for an unanswered or wrong answer.
4. Shade your answers neatly using a **2B lead pencil** in the Answer Entry Sheet.
5. PROCTORING: No one may help any student in any way during the contest.
6. No electronic devices capable of storing and displaying visual information are allowed during the course of the exam. Strictly **No Calculators** are allowed.
7. All students must write and shade their **Name, School and Index Number** in the Answer Entry Sheet and Contest booklet.
8. MINIMUM TIME: Students must stay in the exam hall for at least 1 hour.
9. A student must show detailed working and transfer answers to the Answer Entry Sheet.
10. **No exam papers and written notes can be taken out by any contestant.**



ROUGH WORKING

Section A: 15 Multiple Choice Questions

3 points each

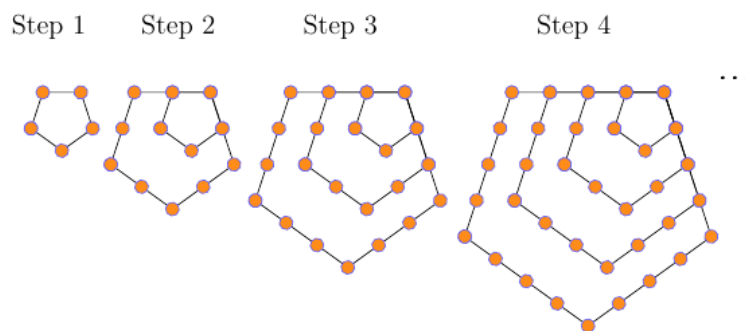
Question 1

Which of the following intervals represents the solution set to the absolute value inequality?

- A.
- B.
- C.
- D.
- E.

Question 2

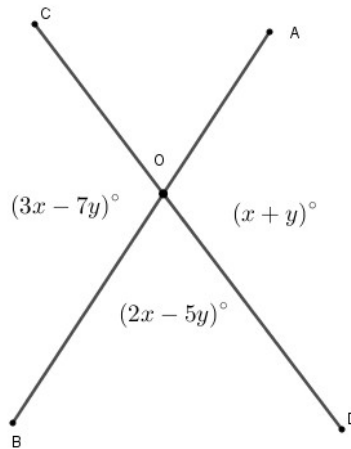
If the following dot pattern continues, how many dots are there at the 25th step?



- A. 925
- B. 1001
- C. 1080
- D. 1162
- E. 2022

Question 3

In the figure below, $\overline{AC}$ and $\overline{BD}$ intersect at a point O . What is the value of x ?



- A. 20
- B. 22.5
- C. 34
- D. 36.5
- E. 40

Question 4

April was making seven bracelets for her friends. It took her 5 minutes to make the first bracelet. Each bracelet after the first one took 20 less time than the one created before. How much time, rounded to the nearest minute, did it take April to make all the seven bracelets?

- A. 11 minutes
- B. 12 minutes
- C. 15 minutes
- D. 20 minutes
- E. 25 minutes

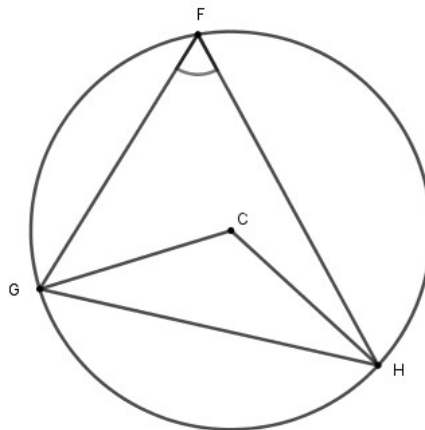
Question 5

Paul and Matt ran into each other at a local restaurant today. Paul said he visits the restaurant every 11 days; Matt said he visits the restaurant every 17 days. If they both keep their schedules, in how many days are they going to see each other again at the restaurant?

- A. 117
- B. 125
- C. 28
- D. 181
- E. 171

Question 6

In the figure below, the circle has its center at C . Points F , G , and H are all on the circle. If $\angle FGH = 110^\circ$, what is the measure of $\angle FCH$ in radians?



- A.
- B.
- C.
- D.
- E.

Question 7

Let a and b be the two solutions to the following absolute value equation:

What is

- A.
- B.
- C.
- D.
- E.

Question 8

The relationship between degrees Fahrenheit and degrees Celsius is given in the following equation:

When a thermometer reads F , what is the temperature in degrees Celsius?

- A.
- B.
- C.
- D.
- E.

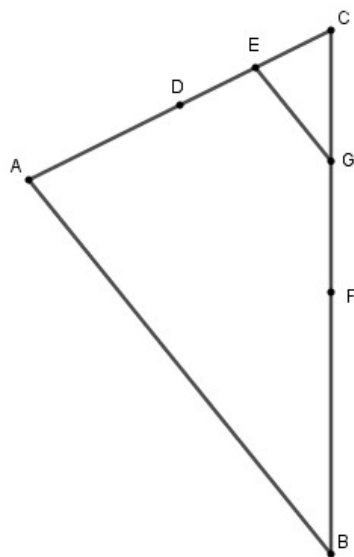
Question 9

We know that $\frac{a}{b} = \frac{c}{d}$ and $\frac{e}{f} = \frac{g}{h}$, where a and c are whole numbers. What is the value of $\frac{a}{b}$?

- A.
- B.
- C.
- D.
- E.

Question 10

In the following figure, D is the midpoint between A and C and E is the midpoint between B and C . F is the midpoint between A and B and G is the midpoint between E and C . What is the ratio between the area of $\triangle ADE$ and the area of $\triangle BFG$?



- A.
- B.
- C.
- D.
- E.

Question 11

What does the value of the following expression get close to as gets increasingly large?

- A.
- B.
- C.
- D.
- E.

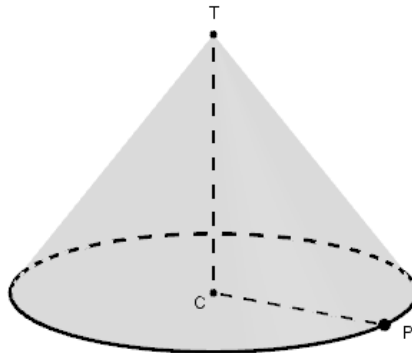
Question 12

, , , are all positive integers. We know that and . What is the simplified value of the following expression?

- A.
- B.
- C.
- D.
- E.

Question 13

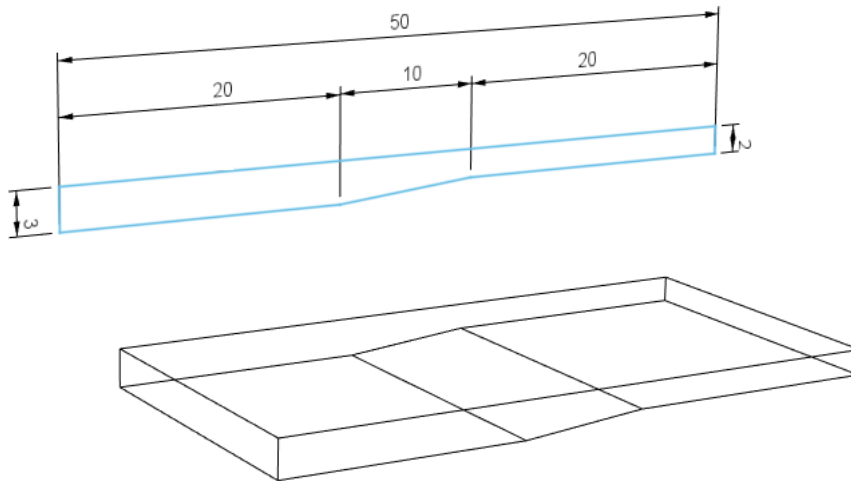
In the figure below, there is a right cone with a base radius of $\frac{1}{2}$ meters and a height of $\frac{3}{4}$ meters. What is the whole surface area of the cone, including the base, in square meters?



- A.
- B.
- C.
- D.
- E.

Question 14

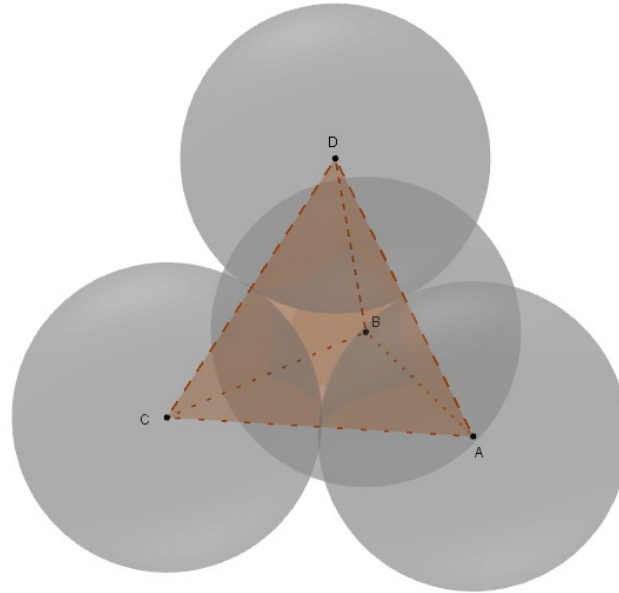
The cross-section and the shape of a public swimming pool are shown in the figure below, where the unit is meters. The pool is 50 meters long and 25 meters wide, with varied depths from 2 meters to 3 meters. The transition in between is smooth. If a pump can fill the pool at 25 cubic meters per hour, how long does it take to fill the pool to the brim?



- A. 50 hours
- B. 75 hours
- C. 100 hours
- D. 125 hours
- E. 150 hours

Question 15

Four spheres, which all have a radius of 1 centimeter, are arranged into a three-dimensional structure shown below. Each sphere touches all the others. What is the volume of the 3D shape, , formed by connecting the centers of the spheres?



- A.
- B.
- C.
- D.
- E.

Section B: 5 Open-Ended Questions

5 points each

Question 16

Mark and Nancy both like collecting flower stickers. The ratio between Mark's collection and Nancy's collection is $3:4$. If Nancy gives Mark 30 stickers, they would have the same number of stickers. How many stickers do they have in total?

Your Answer:

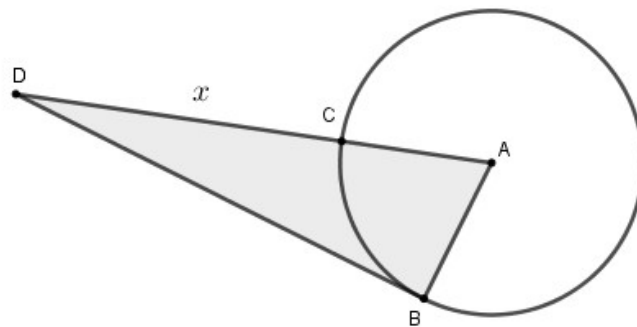
Question 17

There are a large number of marbles in a bag. $\frac{2}{3}$ of the marbles are blue; the rest are all red. Mark is in need of a red marble, and he wants to make a random draw from the bag. If the marble is not red, he simply puts it back and continues. Let P represent the probability that it takes at least three random draws before he gets a red marble. What is P ?

Your Answer:

Question 18

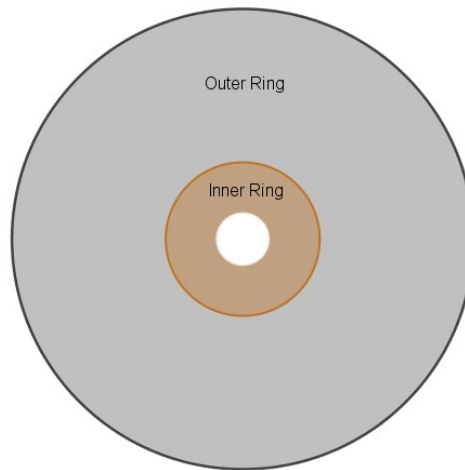
In the figure below, point A is the center of the circle. Points C and B are on the circle. Line segment AC is extended to intersect line segment BD at point C . The area of $\triangle ABD$ is 30cm^2 . What is the length of line segment AC in cm?



Your Answer:

Question 19

Three concentric circles are drawn, creating two rings, as shown in the figure. The radii of the circles are a and b inches, respectively, where $a > b$. What is ratio between the area of the outer ring and the area of the inner ring?



Your Answer:

Question 20

A group of seven students are to stand in a row for a picture. In how many ways can the students be arranged such that the tallest and the shortest students in the group do not sit next to each other?

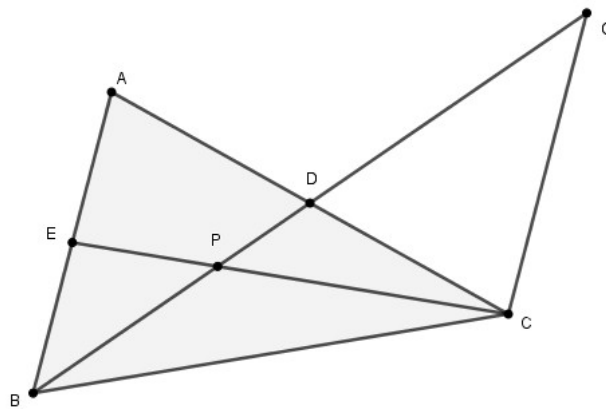
Your Answer:

Section C: 5 Open-Ended Questions

6 points each

Question 21

In the following figure, points D and E are the midpoints of AC and AB , respectively. DE and BC intersect at point P . DE is parallel to BC . DE intersects the extension of BC at point F . If $DE = 4$ cm, what is the length of BC in cm?



Your Answer:

Question 22

If

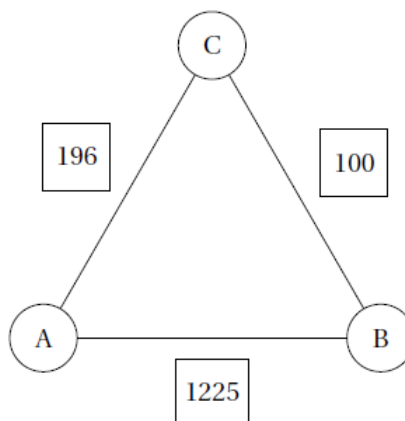
,

what is the value of x for, and

Your Answer:

Question 23

In the figure below, three positive numbers, x , y , and z , are placed at the vertices of a triangle. The product between each pair of neighboring numbers is recorded on the corresponding side. What is the value of x ?



Your Answer:

Question 24

David has two six-sided fair dice, each of which has 6 on its faces. David is interested in the product of the two numbers obtained when the two dice are rolled at random. Specifically, he wonders how likely he will get a square number as the product. He did 1000 trials. How many times should he expect to see a square number?

Your Answer:

Question 25

Greg has a large bag of soybeans. He is interested in estimating the number of soybeans using a statistical method he learned in class. He takes 200 soybeans from the bag and colored them red using a type of food coloring ink. Then, he puts the red beans back to the bag and mixes the beans thoroughly. Finally, he takes 50 beans, at random, from the bag, out of which he finds 4 red beans. How many soybeans should Greg expect to have in the bag?

Your Answer:
