



SECONDARY 2 (GRADE 8) 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

Sam has six different fruits. He would like to pick five different fruits to make a cup of fruit juice. How many different flavors can he make if he always uses five different fruits in each flavor?

- A. Five
- B. Six
- C. Twelve
- D. Fifteen
- E. Thirty

Question 2

The average of ten numbers is 12. If one of the numbers is replaced with 10, the average of the ten numbers becomes 9. What is the original value of the replaced number?

- A. Not enough information
- B. 10
- C. 20
- D. 30
- E. 40

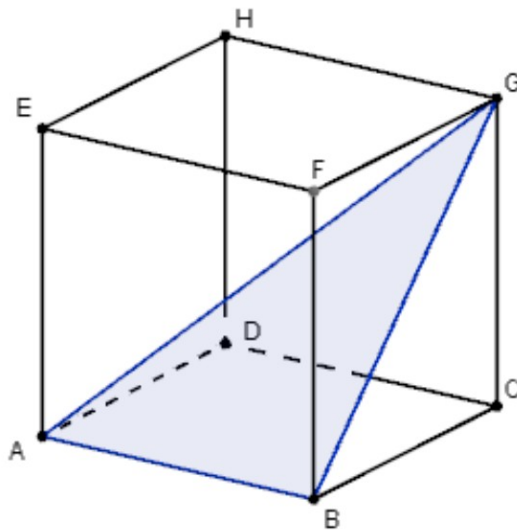
Question 3

After a price cut, a sport shirt is selling for $\frac{3}{4}$ of its original price before taxes. What percentage of an increase will restore the shirt to its original price?

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

Question 4

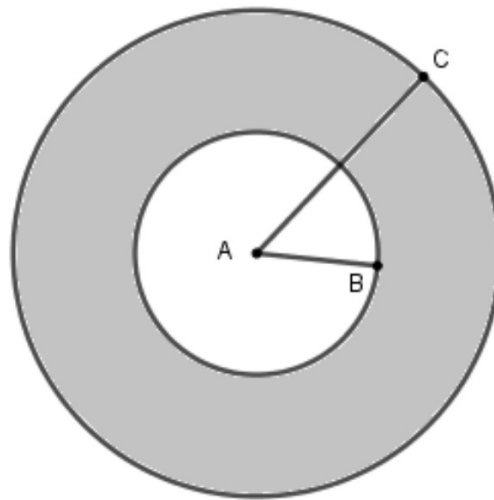
In the figure below, $ABCD$ is a cube, where AB is one inch long. A triangle ABG is constructed inside the cube. What is the perimeter of triangle ABG ?



- A. $\sqrt{2}$ inches
- B. $\sqrt{3}$ inches
- C. $2\sqrt{2}$ inches
- D. $2\sqrt{3}$ inches
- E. $3\sqrt{2}$ inches

Question 5

In the figure below, the two circles share the same center point A . The radius of the small circle is 3 inches long. The radius of the large circle is 5 inches long. What is the ratio between the area of the shaded ring and the area of the small circle?



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

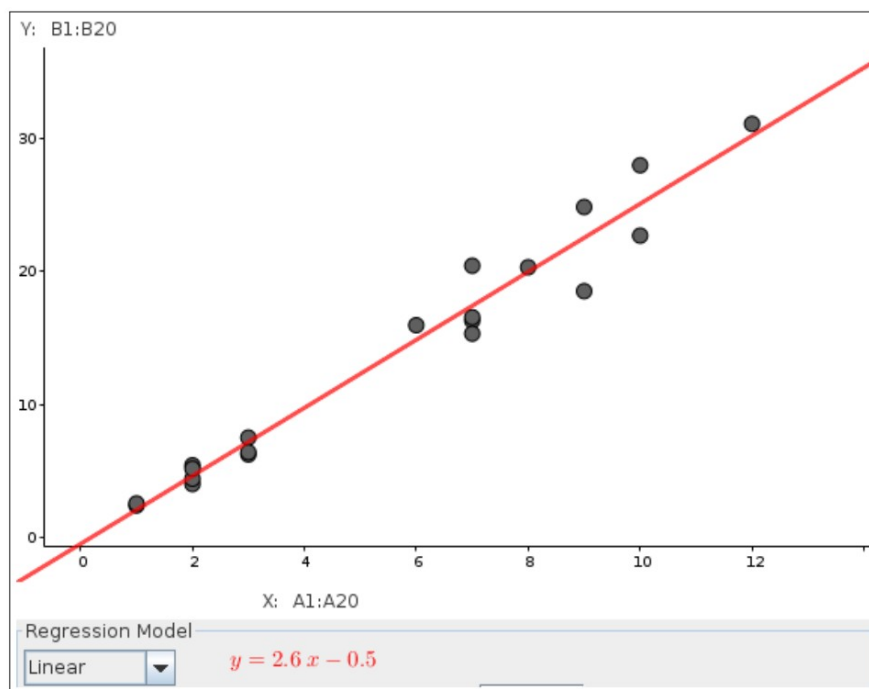
Question 6

In the Cartesian Coordinate Plane, there are three marked points $P(1, 2)$, $Q(4, 6)$, and $R(7, 2)$. If the three points are connected to form a triangle, what is the area of the triangle in unit squares?

- A. 3.5
- B. 4
- C. 4.5
- D. 5.6
- E. 6

Question 7

In a data analysis class, Mrs. Smith's students measured the diameter and circumference of various circular objects in the school building. Using the data collected, they made a scatter plot and further built a linear model: using computer software. The results are shown in the figure below, where represents the circumference and represents the diameter, both in centimeters. Based on the data analysis, what is the circumference of a circle with a diameter of centimeters?



- A. 129.5
- B. 157.5
- C. 314.5
- D. 78.5
- E. 628.5

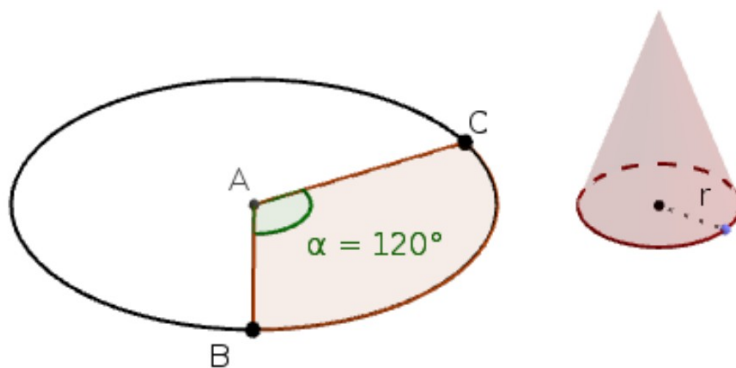
Question 8

In a dark room, there are two boxes, A and B, which contain some small toy balls. Box A has four green balls and six red balls. Box B has eight green balls and two red balls. Amy went to the room and randomly picked a box and then a ball. She came out of the room and found it was a green ball. What is the probability that Amy's ball was taken from Box A?

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

Question 9

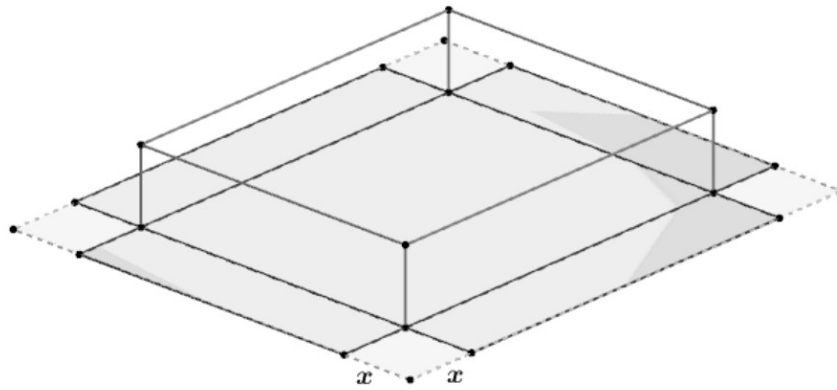
A certain coffee filter is a circle with a radius of three inches. Linda cut out one-third of the circle as shown in the picture and rolled it into a perfect cone without any overlap. What is the radius of the base of the cone?



- A. inch
- B. inches
- C. inches
- D. 1 inch
- E. inches

Question 10

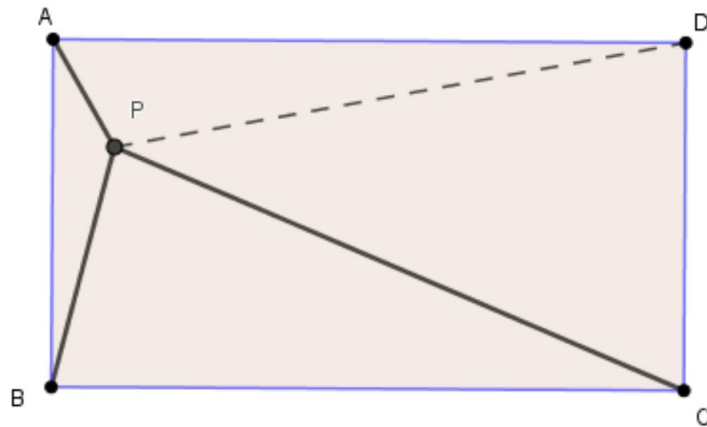
Katrina has a rectangular piece of copy paper that measures 10 inches by 12 inches. To make an open-top box, she cuts four congruent squares off each corner and then folds the rest of the paper into a box as illustrated in the figure. If each square has a side length of 2 inches, what is the volume of the box in cubic inches?



- A. 240
- B. 64
- C. 84
- D. 1205
- E. 96

Question 11

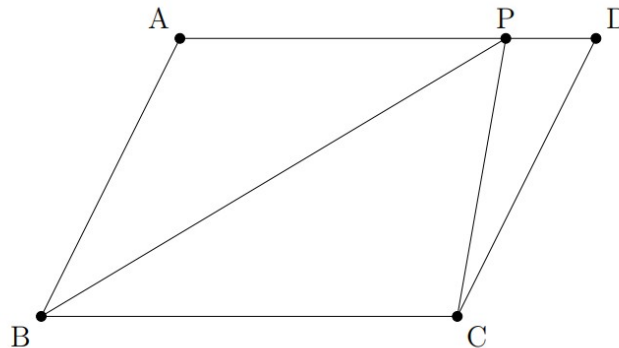
In a math class, Lucy was looking at the cover of her notebook, which is a rectangle. She placed a small marble, represented by P in the figure. Then, she measured the distances from P to three corners, A , B , and C of the notebook, which are 2 inches, 4 inches, and 10 inches, respectively. She then posed a question to her class about the distance from P to D . What is the distance from P to D , based on the information given by Lucy?



- A. Not enough information
- B. 5 inches
- C. 6 inches
- D. 8 inches
- E. 10 inches

Question 12

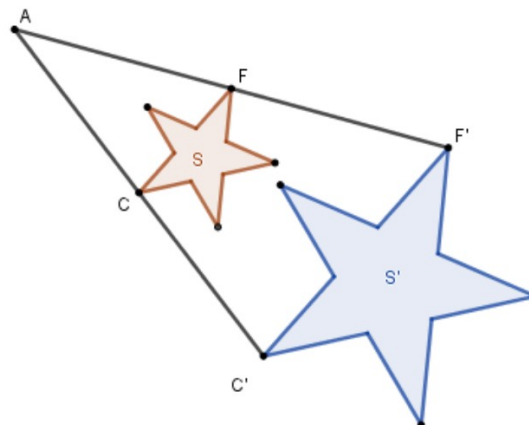
Parallelogram $ABCD$ has an area of 24 square inches. P is a point on AD . What is the area of $\triangle BPC$?



- A. Not enough information
- B. 6 square inches
- C. 18 square inches
- D. 12 square inches
- E. square inches

Question 13

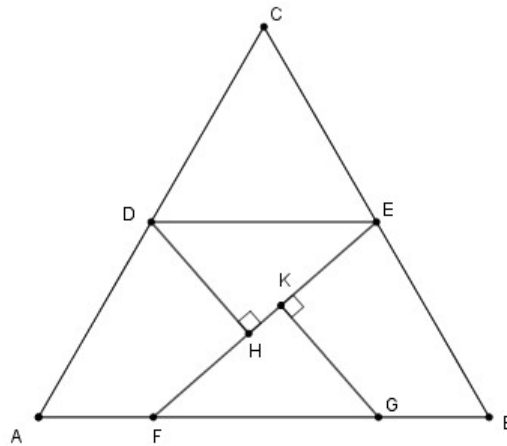
In the figure below, star S is dilated (proportionally scaled) from point A to star S' . The area of star S is 3.8 square inches. What is the area of star S' ?



- A. Not enough information
- B. 7.6 square inches
- C. 11.4 square inches
- D. 15.2 square inches
- E. 19.0 square inches

Question 14

In the figure below, triangle ABC is an equilateral triangle, where AB is one foot long. D and E are the midpoints of AC and BC , respectively. DE is half the length of AB . DE is $\frac{1}{2}$ foot long. What is the length of HK ?



- A. Not enough information
- B. $\frac{1}{4}$ feet
- C. $\frac{1}{2}$ feet
- D. $\frac{\sqrt{3}}{4}$ feet
- E. $\frac{\sqrt{3}}{2}$ feet

Question 15

Consider the hypotenuse of a right triangle with two legs that are two inches and one inch long, respectively. The length of the hypotenuse, in inches, is between which pair of the following fractions?

- A. $\frac{1}{2}$ and $\frac{3}{4}$
- B. $\frac{3}{4}$ and $\frac{5}{8}$
- C. $\frac{5}{8}$ and $\frac{1}{2}$
- D. $\frac{1}{2}$ and $\frac{3}{8}$
- E. $\frac{3}{8}$ and $\frac{1}{4}$

Section B: 5 Open-Ended Questions

5 points each

Question 16

There are three lights, Blue, Green, and Red, which are mounted in a row, and each controlled by its own switch. Each light is either on or off. How many different color patterns can be created?

Your Answer:

Question 17

For what value of x is the following equation true?

Your Answer:

Question 18

In the base-ten number system, ten digits $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ are used for number representations. The base-ten number 825 therefore means 8 hundreds, 2 tens, and 5 ones. Similarly, in the base-three number system, three digits $\{0, 1, 2\}$ are used for number representation. A base-three number 1212 means $1 \cdot 3^3 + 2 \cdot 3^2 + 1 \cdot 3^1 + 2 \cdot 3^0$. What is the base-three representation of the base-ten number 35?

Your Answer:

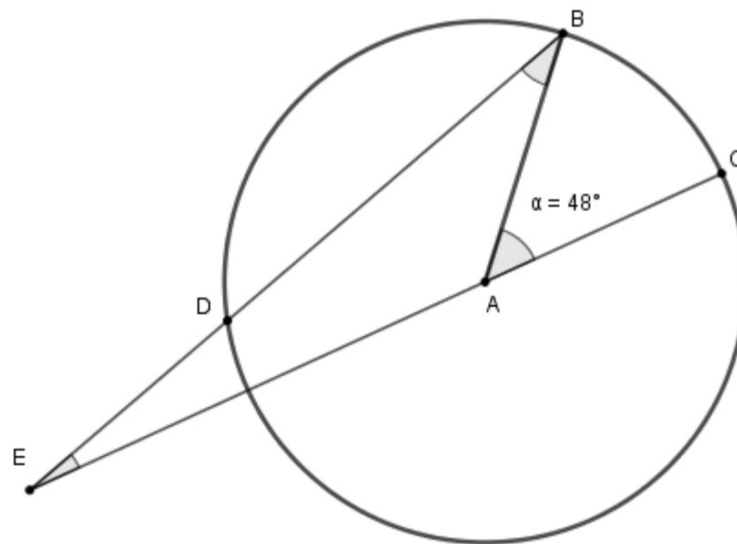
Question 19

What is the value of the following expression?

Your Answer:

Question 20

In the figure below, point A is the center of the circle through points B , C , and D . Points E and A are on the same line as D . Points B , A , and C are also on the same line. The measure of $\angle BEC$ is α . What is the measure in degrees?



Your Answer:

Section C: 5 Open-Ended Questions

6 points each

Question 21

Simplify the following expression and find the value of .

Your Answer:

Question 22

Lacie is making bracelets for her friends. Each bracelet has 11 beads on a loop of elastic cord. For each bead, she has two colors, red or green, to choose from. For Lacie, a bracelet can be rotated without losing its uniqueness but cannot be flipped. How many different bracelets can Lacie make?

Your Answer:

Question 23

Jennifer has a new book to read in the summer. The book has 600 pages. She plans to read one page on the first day and then read three more pages every day than the previous day. In other words, she will read four pages on the second day, seven pages on the third day, and so on. How many days will it take Jennifer to finish the whole book?

Your Answer:

Question 24

Jake agreed to work for a local computer repair company for 100 hours during the summer. In return, he would get a tablet computer and \$800. However, after working for 60 hours, he had to quit the job. The computer company was fair to him. They gave Jake the tablet computer and \$240. How much was the tablet computer worth, assuming it was a fair deal?

Your Answer:

Question 25

At the high school stadium, benches are 18 feet long. If two people are to sit randomly on a bench, the probability that they are more than six feet apart from each other is $\frac{a}{b}$. What is the value of $\frac{a}{b}$?

Your Answer:
