



Singapore Math Kangaroo Contest 2017

Secondary 3 Contest Paper

Name: _____

School: _____

INSTRUCTIONS:

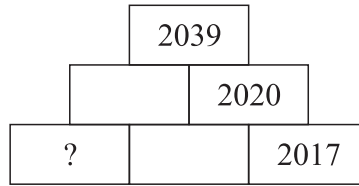
1. Please **DO NOT OPEN** the contest booklet until the Proctor has given permission to start.
2. **TIME : 1 hour and 30 minutes**
3. There are 30 questions in this paper. 3 points, 4 points and 5 points will be awarded for each correct question in Section A, Section B and Section C respectively. No points are deducted for Unanswered question. 1 point is deducted for Wrong answer.
4. Shade your answers neatly in the answer entry sheet.
5. PROCTORING : No one may help any student in any way during the contest.
6. **No calculators** are allowed.
7. All students must fill and shade in your **Name, Index number, Level and School** in the Answer sheet provided.
8. MINIMUM TIME: Students must stay in the exam hall for at least 1 hour and 15 minutes.
9. Students must show detailed working and transfer answers to the answer entry sheet.
10. No spare papers can be used in writing this contest. Enough space is provided for your working of each question.
11. You must return this contest paper to the proctor.

Rough Working

Section A (Correct – 3 points | Unanswered – 0 points | Wrong – deduct 1 point)

Question 1

In this diagram, each number is the sum of the two numbers immediately below it. What number is in the most bottom left box?



- (A) 15 (B) 16 (C) 17 (D) 18 (E) 19

Question 2

Peter wrote the word KANGAROO on a piece of transparent glass as shown in the picture below. What will he see if he flips the paper over to its right and then rotates it one half-turn?



- (A) (B) (C) (D) (E)

Question 3

Angela made a decoration with grey and white asteroids by overlapping them from biggest at the bottom, to the smallest at the top. The areas of the asteroids are 1 cm^2 , 4 cm^2 , 9 cm^2 and 16 cm^2 . What is the total area of the visible grey regions?



- (A) 9 cm^2 (B) 10 cm^2 (C) 11 cm^2 (D) 12 cm^2 (E) 13 cm^2

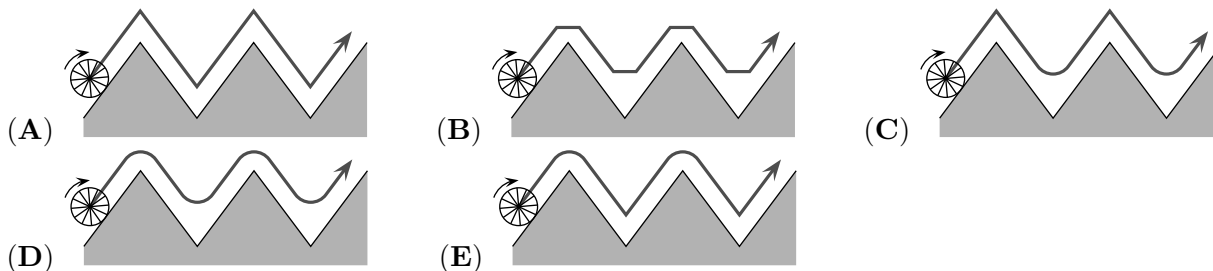
Question 4

Maria has 24 dollars. Every one of her 3 siblings has 12 dollars. How much does she have to give each of her siblings, such that everyone has the same amount?

- (A) 1 dollar (B) 2 dollars (C) 3 dollars (D) 4 dollarsj (E) 6 dollars

Question 5

Which option shows the path of the midpoint of the wheel when the wheel rolls along the zig-zag-curve shown?



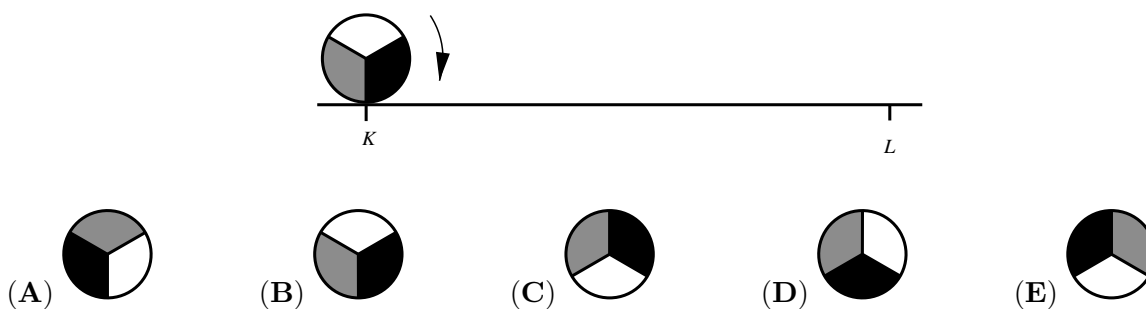
Question 6

Some girls were dancing in a circle. Antonia was the fifth to the left from Bianca and the eighth to the right from Bianca. How many girls were in the group?

- (A) 11 (B) 12 (C) 13 (D) 14 (E) 15

Question 7

Circle of radius 1 rolls along a straight line from the point K to the point L , where $\overline{KL} = 11\pi$. What does the circle look like at L ?



Question 8

Martin is taking part in a chess competition. He won 9 out of 15 matches. If he wins the next 5 matches, what will his success rate be in the competition?

- (A) 60 % (B) 65 % (C) 70 % (D) 75 % (E) 80 %

Question 9

One eighth of the guests at a wedding were children. Three sevenths of the adult guests were men. What fraction of the wedding guests were women?

- (A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{5}$ (D) $\frac{1}{7}$ (E) $\frac{3}{7}$

Question 10

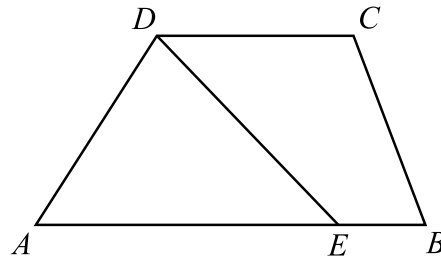
My maths teacher has a box with coloured buttons. There are 203 red buttons, 117 white buttons and 28 blue buttons. What is the least number of buttons he must take from the box without looking, to ensure he has at least 3 buttons of the same colour?

- (A) 3 (B) 6 (C) 7 (D) 28 (E) 203

Section B (Correct – 4 points | Unanswered – 0 points | Wrong – deduct 1 point)

Question 11

$ABCD$ is a trapezoid with sides AB parallel to CD , where $\overline{AB} = 50$, $\overline{CD} = 20$. E is a point on the side AB such that the segment DE divides the given trapezoid into two parts of equal area. Calculate the length \overline{AE} .



- (A) 25 (B) 30 (C) 35 (D) 40 (E) 45

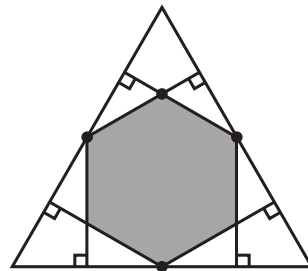
Question 12

How many positive integers A , which satisfy the property that exactly one of the numbers A or $A + 20$ is a 4-digit number?

- (A) 19 (B) 20 (C) 38 (D) 39 (E) 40

Question 13

Six perpendicular lines are drawn from the midpoints on each sides of the triangle to each of the other two sides. What fraction of the area of the initial triangle does the resulting hexagon cover?



- (A) $\frac{1}{3}$ (B) $\frac{2}{5}$ (C) $\frac{4}{9}$ (D) $\frac{1}{2}$ (E) $\frac{2}{3}$

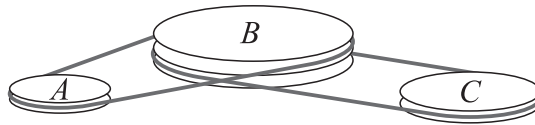
Question 14

The squares of three consecutive positive integers adds up to 770. What is the largest of these 3 integers?

- (A) 15 (B) 16 (C) 17 (D) 18 (E) 19

Question 15

A belt drive system consists of the wheels A , B and C , which rotate without a slippage. B turns 4 full rounds when A turns 5 full rounds, and B turns 6 full rounds when C turns 7 full rounds. Find the perimeter of A if the perimeter of C is 30 cm.



- (A) 27 cm (B) 28 cm (C) 29 cm (D) 30 cm (E) 31 cm

Question 16

Mr Tan wants to prepare a schedule for his jogging over the next few months. Every week, he wants to jog on the same days of the week and he never wants to jog on two consecutive days. In addition, he wants to jog three times per week. How many schedules can he choose from?

- (A) 6 (B) 7 (C) 9 (D) 10 (E) 35

Question 17

Four brothers have different heights. Tom is shorter than Victor by x cm. Tom is taller than Peter by x cm. Oscar is shorter than Peter by x cm. Tom is 184 cm tall and the average height of all the four brothers is 178 cm. How tall is Oscar?

- (A) 160 cm (B) 166 cm (C) 172 cm (D) 184 cm (E) 190 cm

Question 18

It rained 7 times during the holiday. When it rained in the morning, it was sunny in the afternoon. When it rained in the afternoon, it was sunny in the morning. There were 5 sunny mornings and 6 sunny afternoons. How many days did the holiday last at least?

- (A) 7 (B) 8 (C) 9 (D) 10 (E) 11

Question 19

Jenny decided to write numbers in the cells of the 3×3 table below. The sums of the numbers in any 2×2 squares are the same. The three numbers in the corner cells have already been written as shown in the figure. Which number should she write in the bottom right corner cell?

3		1
2		?

- (A) 5 (B) 4 (C) 1 (D) 0
 (E) Impossible to determine

Question 20

Seven positive integers a, b, c, d, e, f, g are written in a row. The sum of all the seven positive integers is equal to 2017; any two neighbouring numbers differ by ± 1 . Which of the numbers can be equal to 286?

- (A) only a or g (B) only b or f (C) only c or e (D) only d (E) any of them

Section C (Correct – 5 points | Unanswered – 0 points | Wrong – deduct 1 point)

Question 21

There are 4 children of different ages under 18. The product of their ages is 882. Assuming that their ages are integers, find the sum of their ages.

- (A) 23 (B) 25 (C) 27 (D) 31 (E) 33

Question 22

On the faces of a given dice these numbers appear: $-3, -2, -1, 0, 1, 2$. If you throw it twice and multiply the two results, what is the probability that the product is negative?

- (A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) $\frac{11}{36}$ (D) $\frac{13}{36}$ (E) $\frac{1}{3}$

Question 23

Given a two digit number \overline{ab} . The six digit number \overline{ababab} is divisible by?

- (A) 2 (B) 5 (C) 7 (D) 9 (E) 11

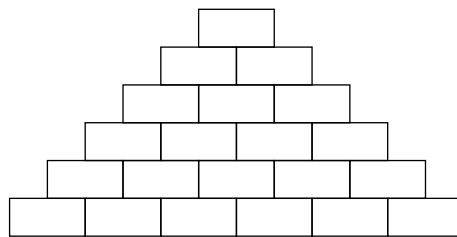
Question 24

My friend wants to use a special seven digit password. The digits of the password occur exactly as many times as its digit value. The same digits of this number are always written consecutively. For example 4444333 or 1666666. How many possible passwords can he choose from?

- (A) 6 (B) 7 (C) 10 (D) 12 (E) 13

Question 25

Paul wants to write a natural number in each box in the diagram such that each number is the sum of the two numbers in the boxes immediately underneath. At most how many odd numbers can Paul write?



- (A) 13 (B) 14 (C) 15 (D) 16 (E) 17

Question 26

Liza calculated the sum of angles of a convex polygon. She missed one of the angles and so her result was 2017° . What angle did she miss?

- (A) 37° (B) 53° (C) 97° (D) 127° (E) 143°

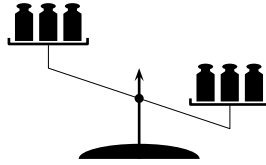
Question 27

There are 30 dancers standing in a circle and facing the centre. After the "Left" command some dancers turned to the left and all the others - to the right. Those dancers who were facing each other, said "Hello". It turned out to be 10 such dancers. Then after the command "Around" all the dancers made a 180° turn. Again, those dancers who were facing each other, said "Hello". How many dancers said "Hello"?

- (A) 10 (B) 20 (C) 8 (D) 15
(E) impossible to determine

Question 28

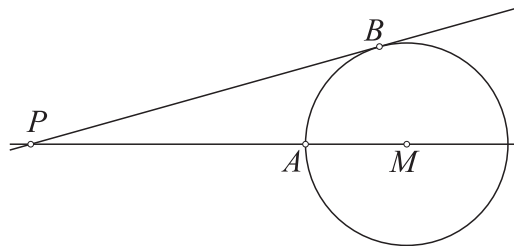
On a balance scale, 3 different masses are put at random on each pan and the result is shown in the picture. The masses are of 101, 102, 103, 104, 105 and 106 grams. What is the probability that the 106 gram mass stands on the heavier (right) pan?



- (A) 75 % (B) 80 % (C) 90 % (D) 95 % (E) 100 %

Question 29

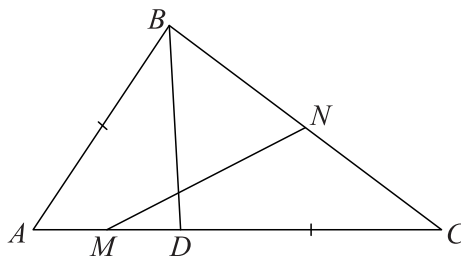
A and B are on the circle with centre M . PB is tangent to the circle at B . The distances \overline{PA} and \overline{MB} are integers, $\overline{PB} = \overline{PA} + 6$. How many possible values are there for \overline{MB} ?



- (A) 0 (B) 2 (C) 4 (D) 6 (E) 8

Question 30

Point D is chosen on the side AC of triangle ABC so that $\overline{DC} = \overline{AB}$. Points M and N are the midpoints of the segments AD and BC , respectively. If $\angle NMC = \alpha$ then $\angle BAC$ always equals to



- (A) 2α (B) $90^\circ - \alpha$ (C) $45^\circ + \alpha$ (D) $90^\circ - \frac{\alpha}{2}$ (E) 60°

Rough Working

Rough Working

Rough Working