Singa Math Assessment Test 2022

For Grades 9/10/11

Time: 45 minutes

NAME:

GRADE:

COUNTRY:

INSTRUCTIONS

1. Please **DO NOT OPEN** the contest booklet until the Proctor has given permission.

2. There are 25 questions.
   Section A: Questions 1 to 20 score 2 marks each, no points are deducted for unanswered or wrong answer.
   Section B: Questions 21 to 25 score 2 marks each, no points are deducted for unanswered or wrong answer.

3. Shade your answers neatly using a 2B pencil in the Answer Entry Sheet.

4. PROCTORING: No one may help any student in any way during the contest.

5. Students must show detailed working and transfer answers to the Answer Entry Sheet.

6. **No exam papers and written notes can be taken out by any contestant.**

Section A (20 x 2 marks = 40 marks)

For questions 1 to 20, choose the correct option and write its number (1, 2, 3 or 4) in the brackets provided. Then shade your option in the Answer Entry Sheet (AES) sheet provided.

1.   What are the range of values of a which satisfy $ax^2 + 8x + a > 6$?

   (1) $a < -2$
   (2) $a > 0$
   (3) $a > 6$
   (4) $a > 8$

2.   The universal set ε is the set of natural numbers less than 18.
      Given that $A = \{x: 2x\text{-}7 < 19 \leq x + 10\}$, what are the elements of A ?

      (1) {9, 10, 11, 12}
      (2) {1, 2, 3, 4, 5, 6, 7, 8, 13, 14, 15, 16, 17}
      (3) {1,3, 5, 7, 11, 13, 17}
      (4) {1, 2, 3, 4, 5, 6, 7, 8}

3.   The mean, median and modal height of 4 boys are 178cm, 176cm and 174cm respectively. What are the heights of the 4 boys in ascending order?

      (1) 174cm, 174cm, 176cm, 178cm
      (2) 174cm, 174cm, 176cm, 182cm
      (3) 174cm, 174cm, 178cm, 186cm
      (4) 174cm, 174cm, 176cm, 188cm

4.   In the list of numbers below, how many prime numbers are there?
            1, 12, 123, 1234, 12345, 123456

      (1) None
      (2) 1
      (3) 2
      (4) 3

5.   Triangle ABC is similar to triangle DBA in the diagram. AD = 8cm, BD = 5cm and CD = 15cm. What is the length of AB?
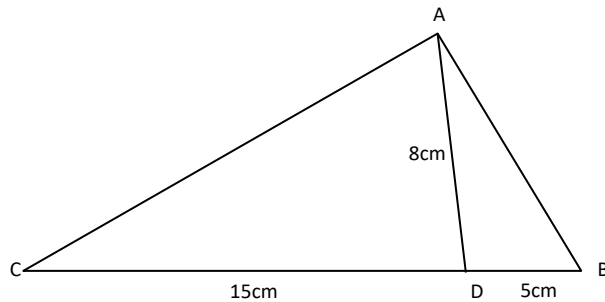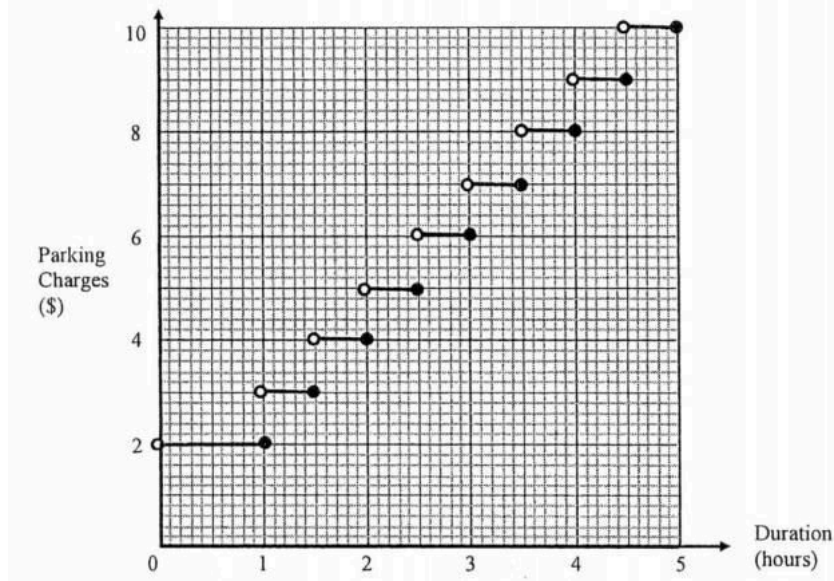

      (1) 9.38cm
      (2) 9.43cm
      (3) 10.0cm
      (4) 12.5cm

6.   An equilateral triangle is surrounded by 3 squares.
      What is the obtuse angle between 2 of the squares?

        (1) 60°
        (2) 90°
        (3) 120°
        (4) 150°

7.   The graph below shows the parking charges for the first 5 hours of a carpark.

      Mr Chen parked his car at this carpark for $3\frac{1}{2}\ h$. What is his parking charges?
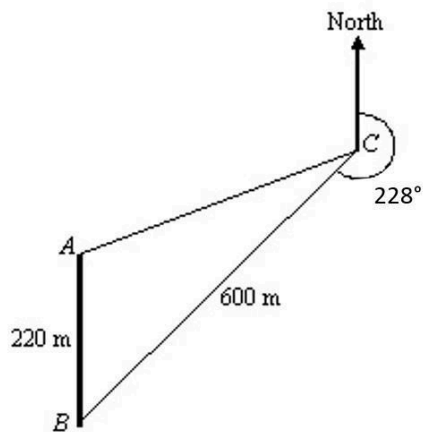
      (1) $6
      (2) $7
      (3) $8
      (4) $13

8.   Given that the first 2 terms in the expansion of $(2-x)$ $(1+3x)^n$ in ascending powers of x is 2+29x+......
what is the value of n?

(1) 5
(2) 6
(3) 24
(4) 27

9.   The circle has an equation $x^2+y^2-2x-168=0$ with P being a point on the circle such that its y-coordinate is positive and twice its x-coordinate. Find the point P.

(1) (5,10)
(2) (6,12)
(3) (7,14)
(4) (8,16)

10.   Find angle ABC in the diagram.

(1) 42°
(2) 48°
(3) 114°
(4) 132°

11.   In the sequence 1, 2, 3, 6… … which of the following is NOT one of the terms that follows?

   (1) 24
   (2) 48
   (3) 72
   (4) 96

12.   A car accelerated at 1.1 m/s^2 for the first part of its journey until it reaches a maximum speed of 22 m/s. It then travelled at a constant speed before slowing down at a uniform rate to a stop after 70 seconds. Given that the car covers a distance of 770m before it starts slowing down, find when the car starts to slow down.

   (1) 20s
   (2) 35s
   (3) 45s
   (4) 50s

13.   Given m and n are positive integers such that $m^2 - n^2 = 17$, what is the value of $\dfrac{2m-2n}{m+n}$?

   (1) $\dfrac{2}{17}$
   (2) $\dfrac{2}{\sqrt{17}}$
   (3) 2
   (4) 34

14. If $\dfrac{1+sec\,A}{tan\,A+sin\,A} = cosec\,A$, solve 1 + sec 2$x$ = 5(tan 2x + sin 2x) for -100°≤x≤100°.

(1) x = -101.5° , 11.5° , 78.5°
(2) x = -95.8°, 5.77°, 84.2°
(3) x = 78.5°
(4) x = 39.2°

15. If point A is (2, -2) and point B is (8, 12), what is the midpoint of AB?

(1) (3, 5)
(2) (5, 5)
(3) (6, 10)
(4) (6, 14)

16. The curve for which $\dfrac{dy}{dx} = 2x - 4$ has a turning point at (2, -9). Find the equation of the curve.

(1) $y = x^2-4x-5$
(2) $y = x^2-4x-7$
(3) $y = x^2-4x-9$
(4) $y = 2x^2-4x-5$

17. The base areas of two geometrically similar tins of beans labelled small and large were 120cm² and 480cm² respectively. If the height of the large tin is 16cm, find the number of small tins that can fit into the large tin.
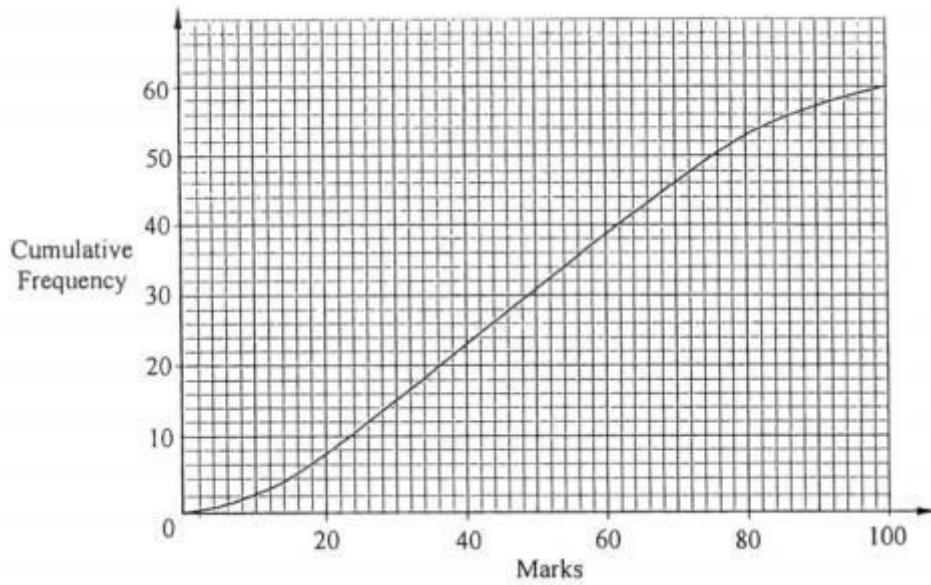
    (1) 8
    (2) 12
    (3) 15
    (4) 16

18. The wooden toy shown is made from a cone and hemisphere of radius 5cm. The total height of the toy is 17cm. What is its total surface area?
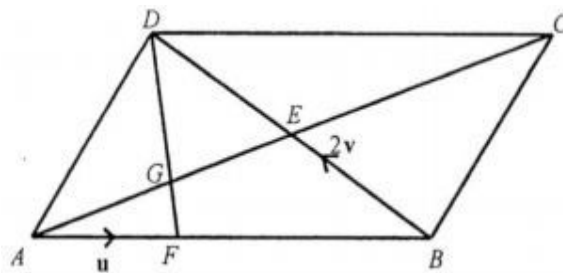

    (1) 50π
    (2) 65π
    (3) 115π
    (4) 165π
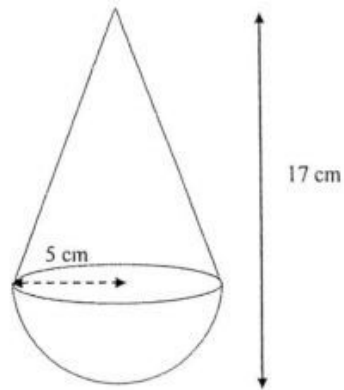
19.   The cumulative frequency curve below shows the marks obtained by 60 students in a Physics test. What is the interquartile range?

(1) 30
(2) 68
(3) 38
(4) 98

20.   In the diagram below, $ABCD$ is a parallelogram. F is on AB such that $FB = 2\,AF$ and $\overrightarrow{AF} = \mathbf{u}$ and $\overrightarrow{BD} = 2\mathbf{v}$. Find $\overrightarrow{DG}$ if $AG=GE$.

(1) $\frac{1}{2}(3\boldsymbol{u} + \boldsymbol{v})$
(2) $-\frac{3}{2}(\boldsymbol{u} + \boldsymbol{v})$
(3) $3\boldsymbol{u}+2\boldsymbol{v}$
(4) $-2(\boldsymbol{u}+\boldsymbol{v})$

Section B (5 x 2 marks = 10 marks)

Read the questions carefully. For questions 21 to 25, show your working clearly and write your answer in the blank provided. Then write and shade your answer in the Answer Entry Sheet (AES) sheet provided.

21. Simplify $\dfrac{1-\dfrac{1}{2}+\dfrac{1}{3}-\dfrac{1}{4}+\dots+\dfrac{1}{2017}-\dfrac{1}{2018}}{\dfrac{1}{1+2019}+\dfrac{1}{2+2018}+\dots+\dfrac{1}{1009+3027}}$

Answer: _____

22. To get a rectangle, a square has its four corners cut off as four isosceles right-angled triangles. What is the sum of the cut off areas if the diagonal length of the rectangle wanted is 10cm?
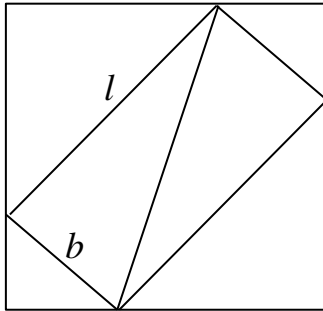
Answer: _____

23. Mr Foo organised a Mathematics competition for all Secondary 4 students in his school. In the competition, participants were only given three content strands of Mathematics: Algebra, Geometry and Mensuration.The total scores of the competitors are computed according to the weighting shown in the following table:

Content strand	Algebra	Geometry	Mensuration
Weighting	4	3	3

The table below shows the scores obtained by 3 of Mr Foo's students.

Student	Algebra	Geometry	Mensuration
E	56	54	51
F	62	h	66
G	82	30	45

The matrix $T = SW$, where S is the scores information 3 x 3 matrix,
W is the weighting information 3 x 1 matrix and $T = \begin{pmatrix} 539 \\ 641 \\ 553 \end{pmatrix}$, find the value of h.

Answer: _____

24. The largest circle with centre at (0, 0) that can be fitted into a region bounded by the lines $x = \pm 5$, $y = \pm 5$, $y = 2x \pm 10$ has an area of $k\pi$ square units. Find the value of k.

Answer: _____

25. A dice is labelled with the integers 1, 2, ..., n such that it is 2 times as likely as to roll a 2 as it is a 1, 3 times as likely to roll a 3 as it is a 1, and so on where n is an even number. If the probability of rolling an odd integer with the dice is $\frac{17}{35}$, find n.

Answer: _____