# SASMO 2015SECONDARY 4

Starting Score = 15 marks (to avoid negative marks); Max Possible Score = 85 marks

**Section A (Correct answer = 2 marks; no answer = 0; incorrect answer = minus 1 mark)**

1. The diagram shows two overlapping squares. The length of the bigger square is 14 cm and the length of the smaller square is 7 cm. Find the difference between the area of the two unshaded regions X and Y.
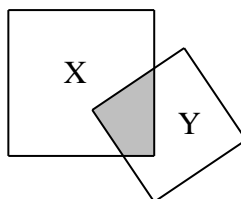
   (a)   137 cm^2
   (b)   147 cm^2
   (c)   157 cm^2
   (d)   167 cm^2
   (e)   None of the above

2. In a class of 40 students, 7 study both Physics and Chemistry, 16 study Physics and 14 study Chemistry. How many students do not study either Physics or Chemistry?

   (a)   3
   (b)   7
   (c)   10
   (d)   17
   (e)   None of the above

3. Find the range of values of k if the curve $y = kx^2 - 2x + (2k - 1)$ lies completely above the x-axis.

   (a) $-\frac{1}{2} < k < 1$
   (b) $k < -\frac{1}{2}$ or $k > 1$
   (c) $0 < k < 1$
   (d) $k > 1$
   (e)   None of the above

4. A number gives a remainder of 9 when divided by 10. Another number gives a remainder of 8 when divided by 10. The sum of these two numbers is multiplied by 12 to give the third number. What is the remainder when this third number is divided by 10?

   (a)   4
   (b)   7
   (c)   8

(d) 9
(e) None of the above

5. In the figure below, the ratio of the trapezium ABCD to the area of the triangle DEF to the area of parallelogram GHJK is 4 : 2 : 3. Given that $\frac{1}{3}$ of the area of ΔDEF is shaded, find the ratio of the area of the shaded region to the total area of the unshaded regions of the figure.
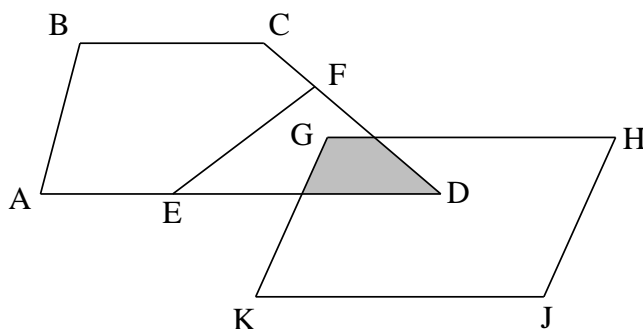
(a) 2 : 11
(b) 2 : 17
(c) 2 : 21
(d) 2 : 27
(e) None of the above

6. Which of the following statement(s) is or are correct?

Statement A: A cubic equation can have 3 real and distinct roots.
Statement B: A cubic equation can have 2 real roots.
Statement C: A cubic equation can have 1 real root and 2 non-real roots

(a) All the three statements are correct.
(b) Only Statements A and B are correct.
(c) Only Statements A and C are correct.
(d) Only Statement A is correct.
(e) None of the above

7. A big cube is made up of 125 small cubes. All the faces of the big cube are then painted. How many of the small cubes have no painted face?

(a) 1
(b) 8
(c) 27
(d) 64
(e) None of the above

8. In ΔABC, AB = 14 cm, BC = 10 cm and AC = 7 cm. Find the value of $\frac{\sin B}{\sin C}$.

(a) 0.5
(b) 1

(c)   2
(d)   Cannot be found
(e)   None of the above

9.   All the match sticks in the diagram are identical. Find the total number of squares in the diagram?
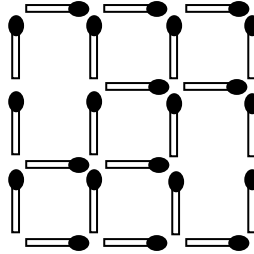
(a)   6
(b)   7
(c)   8
(d)   9
(e)   None of the above

10.   Given that $xyz = 2015$, and x, y and z are positive integers, how many possible triples (x, y, z) are there?

(a)   5
(b)   15
(c)   27
(d)   2015
(e)   None of the above

11.   Given that $-8 \leq x \leq 12$ and $-4 \leq y \leq -2$, find the least possible value of $\frac{x}{y}$.

(a)   4
(b)   2
(c) -3
(d) -6
(e) -12

12.   How many four-digit numbers of the form X56Y are divisible by 24?

(a)   1
(b)   3
(c)   4
(d)   6
(e)   8

13.   A rectangular floor of 1540 cm by 1440 cm is to be covered completely by identical square tiles. What is the least possible number of square tiles?
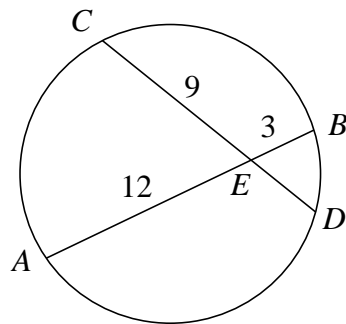
(a)   616

    (b)   5544
    (c)   22 176
    (d)   88 704
    (e)   None of the above

14.   Johnny has 35 toys. He divides them into 5 piles so that each pile has a different number of toys. Find the smallest possible number of toys in the biggest pile.

    (a)   7
    (b)   8
   (c)   9
    (d)   10
    (e)   None of the above

15.   The diagram shows a circle with two chords AB and CD intersecting at E. Given that $AE = 12$ cm, BE = 3 cm and $CE = 9$ cm, find the length of DE.

    (a)   2 cm
    (b)   3 cm
    (c)   4 cm
    (d)   6 cm
    (e)   None of the above

Section B (Correct answer = 4 marks; incorrect or no answer = 0)

16.   A man buys 30 metres of fence to build a rectangular garden at the back of his house.He uses the wall XY at the back of his house as one side of the garden ABCD as shown in the diagram below. Find the largest possible area of the garden.
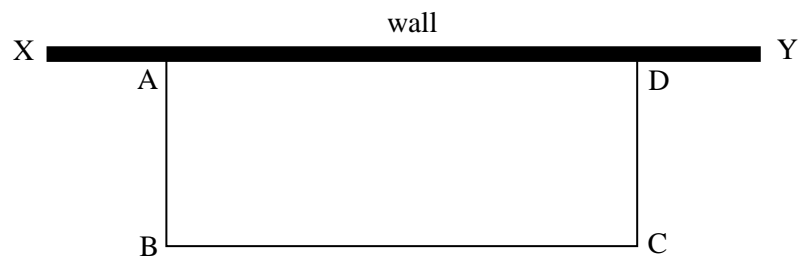
17. In a school hall, $\dfrac{7}{31}$ of the chairs are arranged in rows of 5, and $\dfrac{11}{31}$ of the chairs are arranged in rows of 13. The rest of the chairs are stacked up. If there are less than 4000 chairs in the hall, find the total number of chairs in the hall.

18. Polite numbers are numbers that can be expressed as the sum of two or more consecutive positive integers, e.g.

$$5 = 2 + 3;$$
$$9 = 2 + 3 + 4 = 4 + 5.$$

The degree of politeness of a number is the number of ways a number can be expressed as the sum of two or more consecutive positive integers, e.g. the degree of politeness of 2, 5 and 9 is 0, 1 and 2 respectively.
Find the smallest number with a degree of politeness of 3.

19. Find the value of $\sqrt{12 + \sqrt{12 + \sqrt{12 + \dots}}}$

20. The figure shows a circle with 4 points on its circumference. Each point is joined to every other point by a line (called a chord). The chords divide the circle into 8 regions.

Find the *maximum* number of regions formed by the chords for a circle with <u>7 points</u>.

21. Find the values of k for which the equation $kx^2 - 2015x + (k - 2015) = 0$ has one positive and one negative root.

22. A circle and a triangle are drawn on a rectangular sheet of paper. What is the biggest number of regions that can be formed on the paper?

23. Find the sum of the coefficients in the expansion of $\left(6x^2 - 5x + 2\right)^3 \left(3 - 2x + x^2\right)^4$.

24.   Albert and Bernard just become friends with Cheryl, and they want to know when her birthday is. Cheryl gives them a list of 10 possible dates.

May 15	May 16	May 19
June 17	June 18	
July 14	July 16	
August 14	August 15	August 17

Cheryl then tells Albert and Bernard separately the month and the day of her birthday respectively.

Albert: I don't know when Cheryl's birthday is, but I know that Bernard does not know too.

Bernard: At first I don't know when Cheryl's birthday is, but I know now.

Albert: Then I also know when Cheryl's birthday is.

So when is Cheryl's birthday?

25.   Find the last six digits of 2015^{2015}.