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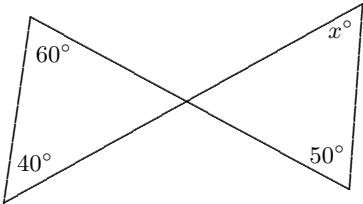
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SENIOR DIVISION

Questions 1 - 10, 3 marks each

1. The value of $\frac{2004 + 6}{100}$ is
(A) 30 (B) 2.1 (C) 201 (D) 20.1 (E) 2.01
2. The value of $\frac{4}{5}$ is closest to
(A) 0 (B) 1 (C) 2 (D) 3 (E) 4
3. If $y = 3x$ and $z = 2 - 3y$, then z equals
(A) $9x$ (B) $2 - 3x$ (C) $8x - 2$ (D) $2 + 3x$ (E) $2 - 9x$
4. The value of x in the diagram is
(A) 50 (B) 100 (C) 80
(D) 40 (E) 70
- 
5. If $2x + 3 > 9$ then
(A) $x > 3$ (B) $x \leq 6$ (C) $x > 6$ (D) $x < 3$ (E) $x \leq 3$
6. If $2^{15} = 4 \times 2^n$, what is the value of n ?
(A) 11 (B) 13 (C) 14 (D) 16 (E) 17
7. A rectangle has its length 25 times its width. What is the ratio of its perimeter to the perimeter of the square of the same area?
(A) 13 : 5 (B) 13 : 10 (C) 5 : 1 (D) 51 : 20 (E) 51 : 10
8. If a person's wage rose 20% to \$360 per week, the wage before the rise was
(A) \$288 (B) \$300 (C) \$310 (D) \$280 (E) \$320

9. I have a patio which is 3 m wide. The roof of this consists of sheets of plastic which are 900 mm wide. I have used as few sheets as possible and made all overlaps the same width. What is the width, in millimetres, of this overlap?

(A) 100 (B) 150 (C) 200 (D) 250 (E) 300

10. Consider the five expressions \sqrt{x} , x^2 , $\frac{1}{\sqrt{x}}$, x^3 and $2x$. If $x > 2$ and these five expressions are arranged in ascending order of magnitude, the middle one will be

(A) \sqrt{x} (B) x^2 (C) $\frac{1}{\sqrt{x}}$ (D) x^3 (E) $2x$

Questions 11 - 20, 4 marks each

11. As one way of saving water during the drought, Holly changed from using the washing machine three times a week to using it once every three days. If the machine uses 120 L of water each time, over a long period the average number of litres saved each week was

(A) 60 (B) 72 (C) 80 (D) 90 (E) 96

12. Which of the following is the sum of four consecutive integers?

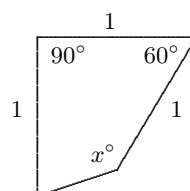
(A) 2000 (B) 2001 (C) 2002 (D) 2003 (E) 2004

13. The yearly changes in population of a mining town for four consecutive years were, respectively, 20% increase, 20% increase, 20% decrease and 20% decrease. The net change over the four years, to the nearest percent, was

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

14. In the diagram, the value of x is

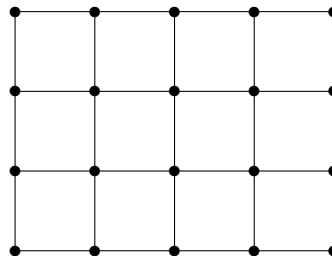
(A) 90 (B) 120 (C) 135
(D) 137.5 (E) 140



15. Two ordinary dice are tossed and the difference between the numbers appearing uppermost on the dice is recorded. What difference is most likely to occur?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

16. In the country Roadonia there are exactly 20 cities and 31 roads connecting neighbouring cities as shown in the diagram. Unfortunately, all the roads are in bad condition and need repair. What is the maximum number of roads which can be closed for repair at the same time so that it is still possible to travel from each city to any other along roads?



(A) 10 (B) 12 (C) 13 (D) 14 (E) 16

17. Natural fruit juice contains 80% water. In concentrating the juice, 75% of the water is removed. What is the percentage of water in the concentrated juice?

(A) 25 (B) 40 (C) 50 (D) 60 (E) 75

18. John tells the truth on Monday, Tuesday, Wednesday and Thursday. He lies on all other days. Dieter tells the truth on Monday, Friday, Saturday and Sunday. He lies on all other days. One day they both said, 'Yesterday I lied'. The day they said that was

(A) Monday (B) Wednesday (C) Thursday
(D) Friday (E) Saturday

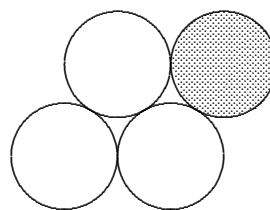
19. If a , b and c are positive integers such that

$$a + \frac{1}{b + \frac{1}{c}} = \frac{37}{16},$$

then $a + b + c$ is equal to

(A) 10 (B) 16 (C) 21 (D) 14 (E) 11

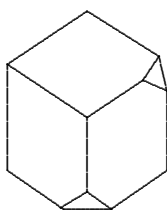
20. Four 10 c coins lie on a table as shown. Keeping in contact with the other three coins, the shaded coin is rolled around the other three coins until it returns to its starting place. Through what angle does the shaded coin turn, on its axis, in rolling once around the other three coins?



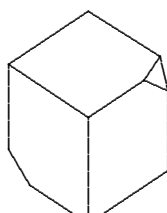
- (A) 360° (B) 540° (C) 720° (D) 900° (E) 1080°

Questions 21 - 30, 8 marks each correct response, 0 marks each incorrect response, 3 marks each no response, 30 marks minimum

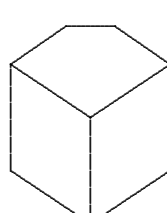
21. Let $PQRSTU$ be a convex hexagon (every angle is less than 180°). The lines defined by the sides PQ , RS and TU intersect at the vertices of an equilateral triangle and so do the lines formed from the sides QR , ST and UP . At most, how many different angle sizes does the hexagon have?
- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5
22. Ann, Ben and Cathy have their birthday today. The sum of their ages is 23. The product of their ages is 113 more than the product of their ages on their birthday last year. What is the sum of the squares of their ages?
- (A) 209 (B) 185 (C) 189 (D) 241 (E) 259
23. Some corners are cut off four cubes. Afterwards, only two of the solids formed are the same shape. Which two are they?



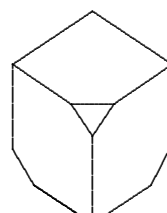
P



Q



R



S

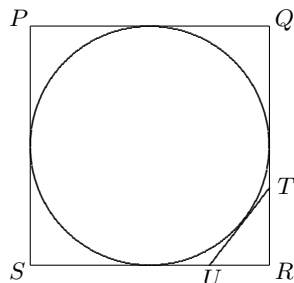
- (A) P and Q (B) P and R (C) Q and R
(D) P and S (E) Q and S

24. The integers 1, 2, 3, . . . , 100 are written on the board. What is the smallest number of these integers that can be wiped off so that the product of the remaining integers ends in 2?

(A) 20 (B) 21 (C) 22 (D) 23 (E) 24

25. In the diagram, the square circumscribes the circle, UT is tangent to the circle and RU is one quarter of RS . What fraction of RQ is RT ?

(A) $\frac{1}{3}$ (B) $\frac{2}{5}$ (C) $\frac{3}{8}$
 (D) $\frac{3}{10}$ (E) $\frac{2}{9}$



26. Seven numbers, each 1 or -1 , are listed in a row in such a way that adding the numbers successively from left to right never gives a negative answer. For example, 1 -1 1 1 -1 -1 1 has successive sums 1, 0, 1, 2, 1, 0, 1 and is valid, while 1 1 -1 -1 -1 1 1 has successive sums 1, 2, 1, 0, -1 , 0, 1, and is not valid. How many valid lists are there?

(A) 35 (B) 34 (C) 33 (D) 32 (E) 31

27. What is the largest possible size of an angle of a triangle formed by joining the midpoints of three edges of a cube?

(A) 60° (B) 90° (C) 120° (D) 135° (E) 150°

28. There are exactly 3 integers x satisfying the inequality

$$x^2 + bx + 2 \leq 0.$$

How many integer values of b are possible?

(A) 0 (B) 1 (C) 2 (D) 4 (E) 9

29. The smallest possible value that

$$\sqrt{x^2 + y^2} + \sqrt{(x-1)^2 + y^2} + \sqrt{x^2 + (y-1)^2} + \sqrt{(x-3)^2 + (y-4)^2}$$

can have is

- (A) 5 (B) $4 + \sqrt{3}$ (C) 6 (D) $5 + \sqrt{2}$ (E) 7

30. Lois and Ben are playing a game with red, yellow, green and blue counters. They are making as long a line as possible while obeying the following two rules:-

- (1) No two adjacent counters can be the same colour.
- (2) If, in the sequence, any colour occurs twice, no colour between them can occur elsewhere.

Thus *rygbgg* would be banned by only the first rule, and *rbgygbrg* would be banned by only the second rule.

Lois has started her line with *ryr* and Ben has started his with *ryg*. Which of the following statements is true?

- (A) It is possible for Lois to make a longer sequence than Ben can make.
- (B) It is possible for Ben to make a longer sequence than Lois can make.
- (C) It is possible for both to make sequences of length 6, but no longer.
- (D) It is possible for both to make sequences of length 7, but no longer.
- (E) There is no limit on the length of the sequence either can make.