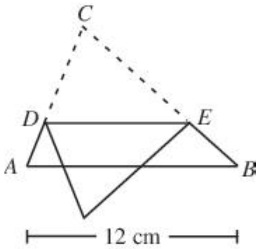
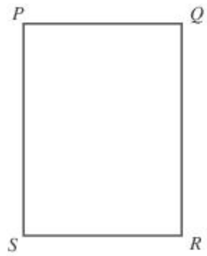
Section B, 1 mark for each question.

Full work must be shown to get marks.

1. The base of a triangular piece of paper ABC is 12 cm long. The paper is folded down over the base, with the crease DE parallel to the base of the paper. The area of the triangle that projects below the base is 16% that of the area of the triangle ABC. The length of DE, in cm, is
(A) 9.6 (B) 8.4 (C) 7.2
(D) 4.8 (E) 6.96

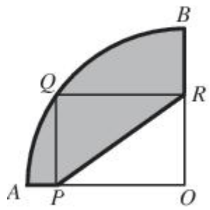


2. The top section of an 8 cm by 6 cm rectangular sheet of paper is folded along a straight line so that when the top section lies flat on the bottom section, corner P lies on top of corner R. The length of the crease, in cm, is
(A) 6.25 (B) 7 (C) 7.5
(D) 7.4 (E) 10



3. Suppose $N = 1 + 11 + 101 + 1001 + 10001 + \ldots + \overbrace{1000\ldots00001}^{50zeroes}$.When N is calculated and written as a single integer, the sum of its digits is
(A) 58 (B) 99 (C) 55 (D) 50 (E) 103

4. In the diagram, AOB is a quarter circle of radius 10 and $PQRO$ is a rectangle of perimeter 26. The perimeter of the shaded region is
(A) $7 + 5\pi$ (B) $13 + 5\pi$ (C) $17 + 5\pi$
(D) $7 + 25\pi$ (E) $17 + 25\pi$



5. Three distinct integers a, b and c satisfy the following three conditions:
   - $abc = 17,955$,
   - a, b and c form an arithmetic sequence in that order, and
   - $(3a + b)$, $(3b + c)$, and $(3c + a)$ form a geometric sequence in that order.

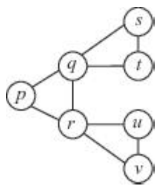
What is the value of $a + b + c$?(An *arithmetic sequence* is a sequence in which each term after the first is obtained from the previous term by adding a constant. For example, $3, 5, 7$ is an arithmetic sequence with three terms.A *geometric sequence* is a sequence in which each term after the first is obtained from the previous term by multiplying it by a non-zero constant. For example, 3, 6, 12 is a geometric sequence with three terms.)
(A) -63 (B) -42 (C) $-68,229$ (D) -48 (E) 81

6. A *Fano table* is a table with three columns where
   - each entry is an integer taken from the list $1, 2, 3, \ldots, n$, and
   - each row contains three different integers, and
   - for each possible pair of distinct integers from the list $1, 2, 3, \ldots, n$, there is exactly one row that contains both of these integers.

The number of rows in the table will depend on the value of n. For example, the table shown is a Fano table with $n = 7$. (Notice that 2 and 6 appear in the same row only once, as does every other possible pair of the numbers $1, 2, 3, 4, 5, 6, 7$.) For how many values of n with $3 \leq n \leq 12$ can a Fano table be created?
(A) 2 (B) 3 (C) 5
(D) 6 (E) 7

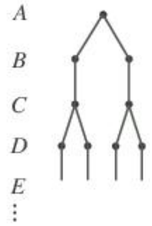
1	2	4
2	3	5
3	4	6
4	5	7
5	6	1
6	7	2
7	1	3

7. In the diagram, each of p, q, r, s, t, u, v is to be replaced with 1, 2 or 3 so that p, q and r are all different, q, s and t are all different, and r, u and v are all different. What is the maximum possible value of $s + t + u + v$?
(A) 8 (B) 9 (C) 11
(D) 7 (E) 10



8. How many triples (a, b, c) of positive integers satisfy the conditions $6ab = c^2$ and $a < b < c \leq 35$?
(A) 10 (B) 8 (C) 6 (D) 7 (E) 9

9. In the diagram, there are 26 levels, labelled $A, B, C, \ldots, Z$. There is one dot on level A. Each of levels $B, D, F, H, J, \ldots$, and Z contains twice as many dots as the level immediately above. Each of levels $C, E, G, I, K, \ldots$, and Y contains the same number of dots as the level immediately above. How many dots does level Z contain?



(A) **1024** (B) **2048** (C) **4096**
(D) **8192** (E) **16,384**

10. For each positive integer n, define $S(n)$ to be the smallest positive integer divisible by each of the positive integers $1, 2, 3, \ldots, n$. For example, $S(5) = 60$. How many positive integers n with $1 \leq n \leq 100$ have $S(n) = S(n + 4)$?

(A) **9** (B) **10** (C) **11** (D) **12** (E) **13**