

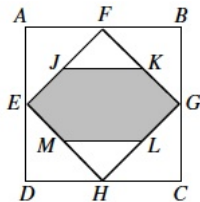
Pascal and Cayley Contest Preparation

Problem Set 3

- If $x = 3$, which of the following expressions is an even number?
(A) $9x$ (B) x^3 (C) $2(x^2 + 9)$ (D) $2x^2 + 9$ (E) $3x^2$
- Carly takes three steps to walk the same distance as Jim walks in four steps. Each of Carly's steps covers 0.5 metres. How many metres does Jim travel in 24 steps?
(A) 16 (B) 9 (C) 36 (D) 12 (E) 18
- Triangle ABC is constructed with $\angle ACB = 120^\circ$ and $\angle CAB = 40^\circ$. AC is extended to P so that $AP = AC + 2CB$. Determine the measure of $\angle ABP$.
- Two perpendicular diameters are drawn in a circle of radius 2. All possible chords parallel to and at a distance of 1 unit from these diameters are drawn. What is the sum of the lengths of the six chords?
- An *ascending* integer occurs when each digit is greater than any digit that precedes it. An example is 478. How many ascending integers occur between 200 and 300?
- Of 45 students in a mathematics class, 27 own a bicycle and 22 own a skateboard. Three students do not own either one. How many students own both a bicycle and a skateboard?
- In the diagram, the four circles have a common centre, and have radii of 1, 2, 3 and 4. The ratio of the area of the shaded regions to the area of the largest circle is



- (A) 5:8 (B) 1:4 (C) 7:16 (D) 1:2 (E) 3:8
- The area of square $ABCD$ is 64. The midpoints of its sides are joined to form the square $EFGH$. The midpoints of its sides are J, K, L and M . The area of the shaded region is



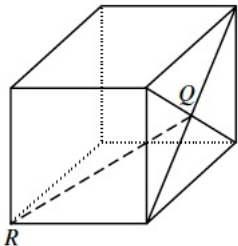
- (A) 32 (B) 24 (C) 20 (D) 28 (E) 16

9. Using only digits 1, 2, 3, 4 and 5, a sequence is created as follows: one 1, two 2's, three 3's, four 4's, five 5's, six 1's, seven 2's, and so on.
the sequence appears as: 1, 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 5, 5, 1, 1, 1, 1, 1, 1, 2, 2,

The 100th digit in the sequence is

- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

10. Q is the point of intersection of the diagonals of one face of a cube whose edges have length 2 units.
The length of QR is



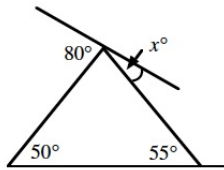
- (A) 2 (B) $\sqrt{8}$ (C) $\sqrt{5}$ (D) $\sqrt{12}$ (E) $\sqrt{6}$

Problem Set 4

1. A bag contains 5 red, 6 green, 7 yellow, and 8 blue jelly beans. A jelly bean is selected at random. What is the probability that it is blue?

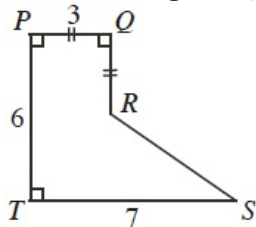
(A) $\frac{5}{26}$ (B) $\frac{3}{13}$ (C) $\frac{7}{26}$ (D) $\frac{4}{13}$ (E) $\frac{6}{13}$

2. The value of x is



(A) 25 (B) 30 (C) 50 (D) 55 (E) 20

3. In the diagram, what is the perimeter of polygon $PQRST$?

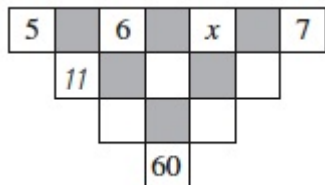


(A) 24 (B) 23 (C) 25 (D) 26 (E) 27

4. The vertices of a triangle have coordinates $(1,1)$, $(7,1)$ and $(5,3)$. What is the area of this triangle?

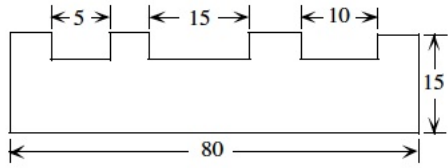
(A) 12 (B) 8 (C) 6 (D) 7 (E) 9

5. The number in an unshaded square is obtained by adding the numbers connected to it from the row above. The value of x must be



(A) 4 (B) 6 (C) 9 (D) 15 (E) 10

6. Three small rectangles, of the same depth, are cut from a rectangular sheet of metal. The area of the remaining piece is 990. What is the depth of each cut?



- (A) 8 (B) 7 (C) 6 (D) 5 (E) 4

7. If the surface area of a cube is 54, what is its volume?

- (A) 36 (B) 9 (C) $\frac{81\sqrt{3}}{8}$ (D) 27 (E) $162\sqrt{6}$

8. The numbers 6, 14, x , 17, 9, y , 10 have a mean of 13. What is the value of $x + y$?

- (A) 20 (B) 21 (C) 23 (D) 25 (E) 35

9. In the magic square, the sum of the three numbers in any row, column or diagonal are the same.

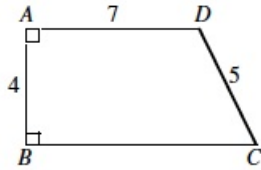
$2x$	3	2
		-3
0	x	

The sum of the three numbers in any row is

- (A) 0 (B) 1 (C) 3 (D) 7 (E) 9
10. A light flashes every 6 minutes and a bell rings every 8 minutes. If the light flashes as the bell is ringing, then the smallest number of minutes which must elapse before this occurs is
- (A) 14 (B) 42 (C) 48 (D) 72 (E) 24
11. An *ascending* integer occurs when each digit is greater than the digit on its left. An example is 2478. The number of ascending integers between 4000 and 5000 is
- (A) 7 (B) 8 (C) 9 (D) 10 (E) 11
12. How many integers between 2 and 50 can be written of the form x^y , where x and y are positive integers and $y \neq 1$?
- (A) 6 (B) 7 (C) 8 (D) 9 (E) 10
13. When 54 is subtracted from a two-digit number, the result is a number having the same two digits reversed in order. The number of two-digit numbers with this property is
- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

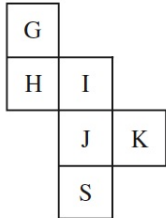
Problem Set 5

1. In the diagram, $AD < BC$. What is the perimeter of $ABCD$?



- (A) 23 (B) 26 (C) 27 (D) 28 (E) 30

2. If the figure is folded to make a cube, what letter is opposite G?

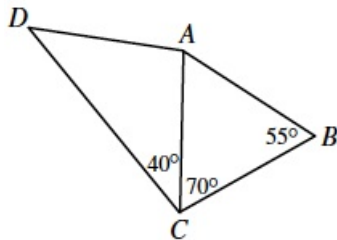


- (A) S (B) H (C) I (D) J (E) K

3. A store had a sale on T-shirts. For every two T-shirts purchased at the regular price, a third T-shirt was bought for \$1.00. Twelve T-shirts were bought for \$120.00. What was the regular price for one T-shirt?

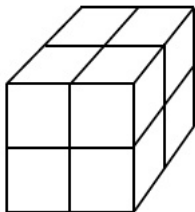
- (A) \$10.00 (B) \$13.50 (C) \$14.00 (D) \$14.50 (E) \$15.00

4. In the diagram, $DA = CB$. What is the measure of $\angle DAC$?



- (A) 70° (B) 100° (C) 95° (D) 125° (E) 110°

5. Eight unit cubes are used to form a large 2 by 2 by 2 cube. The six faces of this larger cube are then painted red. When the paint is dry, the larger cube is taken apart. What fraction of the total surface area of the unit cubes is red?



- (A) $\frac{1}{6}$ (B) $\frac{2}{6}$ (C) $\frac{1}{2}$ (D) $\frac{1}{4}$ (E) $\frac{1}{3}$

6. When 14 is divided by 5, the remainder is 4. When 14 is divided by the positive integer n , the remainder is 2. For how many different values of n is this possible?

- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

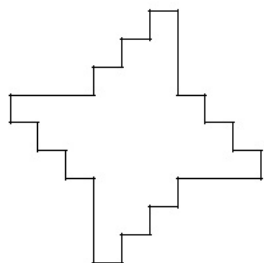
7. A gardener has a push mower and a riding mower. It takes her five hours to cut the entire lawn the the push mower but only 70 minutes with the riding mower. After 90% of the lawn was cut using the riding mower, the remainder was cut using the push mower. How many minutes did it take to cut the lawn?

(A) 120 (B) 75 (C) 70 (D) 277 (E) 93

8. How many integers are between $\sqrt{40}$ and $\sqrt{400}$?

(A) 12 (B) 13 (C) 14 (D) 15 (E) 16

9. In the diagram, adjacent edges are at right angles. The four longer edges are equal in length, and all of the shorter edges are also equal in length. The area of the shape is 528. What is the perimeter?



(A) 132 (B) 264 (C) 92 (D) 72 (E) 144

10. The digits 1, 2, 3, 4, 5 and 6 are each used once to compose a six digit number $abcdef$, such that the three digit number abc is divisible by 4, bcd is divisible by 5, cde is divisible by 3, and def is divisible by 11. The digit a is

(A) 1 (B) 2 (C) 3 (D) 4 (E) 6

11. If n is a positive integer and $n(n + 1)$ is divided by 3, the remainder can be

(A) 0 only (B) 2 only (C) 0 or 1 only (D) 0 or 2 only (E) 0, 1, or 2

12. Suppose that a, b and c are three numbers with

$$a + b = 3$$

$$ac + b = 18$$

$$bc + a = 6$$

The value of c is

(A) 2 (B) 11 (C) 3 (D) 6 (E) 7