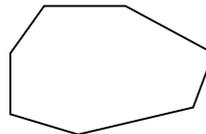


Blitz, Page 1

1. The sides of a cube are increased by 100%. By how many percent does the volume of the cube increase? 1. _____ percent
2. How many primes are there between 90 and 100? 2. _____
3. Approximately how many metres are there in $\frac{1}{11}$ of a kilometre? Round your answer to the *nearest* metre. 3. _____ metres
4. What is 40% of the number which is 25% greater than 144? 4. _____
5. What is the smallest integer that is bigger than the reciprocal of 0.032? 5. _____
6. What is the smallest sum of money (in cents) that you *cannot* pay using five or fewer standard Canadian coins? 6. _____ cents
7. Find the sum, in degrees, of the internal angles of a convex heptagon (a convex 7-sided polygon). 7. _____ degrees



Blitz, Page 2

8. Express $\frac{1}{4} + \frac{2}{5} + \frac{3}{6}$ as a common fraction. 8. _____
9. Alana's necklace broke. She found one-third of the beads on the floor and one-quarter on the couch. One-sixth of the beads remained strung on the necklace. The rest of the beads (15 beads) were never found. How many beads were originally on the necklace? 9. _____ beads
10. A 385 ml can of orange juice concentrate was mixed in a jug with four 385 ml cans of water. Alan drank 385 ml of the mixture, and replaced it with 385 ml of water. After that, how many percent of the contents of the jug were orange juice concentrate? 10. _____ percent
11. What is the number of integer solutions of $-5 < \frac{n}{3} < 5$? 11. _____
12. A trucker stopped for diesel when her tank was one-eighth full. She bought 80 litres of diesel for \$90. She then noticed that her tank was only three-quarters full, so she returned to the station and filled the tank completely. How many dollars did she pay for that last one-quarter of a tank? 12. _____ dollars
13. Alex has three boxes of marbles. In the first box, 30% of the marbles are blue. There are twice as many marbles in the second box as in the first box, and 25% are blue. There are twice as many marbles in the third box as in the second box, and 20% are blue. If Alex loses the third box, how many percent of his blue marbles does he lose? 13. _____ percent
14. Three standard dice are tossed. How many different possible *sums* are there? 14. _____ sums

Blitz, Page 3

15. Suppose that

$$(x + 1) + (x + 2) + (x + 3) + \cdots + (x + 99) + (x + 100) = 12000.$$

What is the value of

$$(x + 101) + (x + 102) + (x + 103) + \cdots + (x + 199) + (x + 200)?$$

15. _____

16. For any real number x , let $\lfloor x \rfloor$ be the greatest integer which is less than or equal to x . For example, $\lfloor 3.65 \rfloor = \lfloor 3 \rfloor = 3$. What is the value of

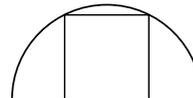
$$\lfloor \sqrt[3]{1} \rfloor + \lfloor \sqrt[3]{2} \rfloor + \lfloor \sqrt[3]{3} \rfloor + \cdots + \lfloor \sqrt[3]{25} \rfloor + \lfloor \sqrt[3]{26} \rfloor?$$

16. _____

17. A car and a truck got on the freeway at the same place and time. After they had gone for 40 minutes in the same direction, the car was 6 kilometres ahead of the truck. The car's average speed was 100 km/hr. What was the truck's average speed, in km/hr?

17. _____ km/hr

18. What is the area of the square inscribed in a semicircle of radius 1? Express the answer as a common fraction.



18. _____

19. Alphonse owes Beth 20 cents. In how many different ways can he pay the debt using pennies and/or nickels and/or dimes? Note that for example 5 pennies, 1 nickel, and 1 dime is the same way as 1 dime, 5 pennies, and 1 nickel.

19. _____ ways

20. What is the sum of the first 2010 terms of the sequence

$$0, 1, 2, 3, 0, 1, 2, 3, 0, 1, 2, 3, 0, 1, 2, \dots?$$

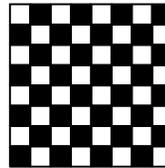
20. _____

21. A sequence a, b, c, d, e of five numbers has the following properties: 21. _____
 (i) $a = 1$; (ii) $e = 98$; (iii) every number after the second is the sum of the previous two numbers. What is the value of b ?

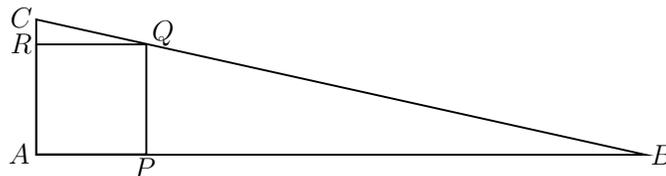
22. What is the smallest positive integer N such that the first four digits of N are 2, 0, 1, 0 (in that order) and such that N is divisible by 45? (Your answer should look like 2010....) 22. _____

23. Two integers are *relatively prime* if 1 is the largest integer that divides both of them. For example, 21 and 47 are relatively prime. Alan and Beth each pick independently and at random an integer from 1 to 6 (inclusive). What is the probability that the numbers they pick are relatively prime? Express the answer as a common fraction. 23. _____

24. How many squares of all sizes are on a standard 8×8 chessboard? 24. _____ squares



25. In the picture below, $\triangle ABC$ is right-angled at A , P lies on AB , Q lies on BC , R lies on CA , and $APQR$ is a square. The length of AB is 24 and the length of AC is 5. What is the length of AP ? Write the answer as a common fraction. 25. _____



26. You play the “Lucky 4” game as follows. You roll a fair standard die and receive in pennies the number you rolled. You keep doing this until either you have accumulated exactly 4 pennies, in which case you win, and the game is over, or your last roll pushes you over 4 pennies, in which case you lose. What is the probability that you win? Express the answer as a common fraction. 26. _____

Bull's-eye, Page 1: Problem Solving

1. Some students went on a school ski trip by car, 3 per car, and the rest went by van, 5 per van. In total, 140 students went, using 40 vehicles. How many students went by car? 1. _____ students
2. When Beth goes from her home up to Mount Baker, her car uses on average 13 litres of gas for every 100 kilometres. On the way back from Mount Baker (using the same route), her car averages 11 litres of gas for every 100 km. The round trip uses 33 litres of gas. How many km in total are there in the round trip? 2. _____ km
3. Alfred wrote eight math tests, each graded out of 100. His average after six tests wasn't very good, but his seventh test raised his average by 2 marks, and his eighth test raised his average by another 2 marks. How many more marks did he get on the eighth test than on the seventh? 3. _____ marks
4. The average of nine positive integers is 18. The integers are not necessarily all different. What is the largest possible value of the median of the nine integers? 4. _____

Bull's-eye, Page 2: Numbers and Combinatorics

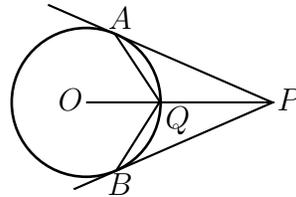
5. Alice picks an integer from 1 to 10 (inclusive) at random and Bob picks an integer from 11 to 20 (inclusive) at random. What is the probability that the product of Alice's number and Bob's number is a multiple of 3? Express the answer as a common fraction. 5. _____
6. What is the smallest number that can be written as the sum of two unequal primes in two different ways? Note that for example $5 = 2 + 3$ and $5 = 3 + 2$ should not be regarded as different ways. 6. _____
7. What is the remainder when $8!$ is divided by 256? 7. _____
8. Let $a = 888888$ and let $b = 999999$. What is the sum of the (decimal) digits of $a \times b$? 8. _____

Bull's-eye, Page 3: Geometry

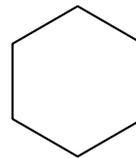
9. A semicircle has the same area as a circle of radius 1. What is the radius of the semicircle? Express the answer in simplest radical form. 9. _____

10. What is the volume, in cm^3 , of a right circular cone of height 8 cm whose base is a circle of radius $\frac{6}{\sqrt{\pi}}$? 10. _____ cm^3

11. The diagram shows a circle, and two tangent lines PA and PB . The points A , B , and Q are on the circle, and Q is on the line segment that joins the centre O of the circle to P . Suppose that the measure of $\angle APB$ is 34° . What is the degree measure of $\angle AQB$? 11. _____ degrees



12. Consider all ordered pairs (A, B) , where A and B are distinct vertices of a regular hexagon whose edges have length 5. What is the average value of the distance between A and B ? Express the answer in simplest radical form. 12. _____ units



Co-op, Page 1: Team answers must be on the *coloured* page.
Answers on a white page will not be graded.

1. The volume of a cylinder is 144π cubic inches. The radius of the base of the cylinder is a whole number of inches. The height of the cylinder is a whole number of inches. How many different such cylinders are there? 1. _____ cylinders

2. A, B, C, and D are running a marathon along a straight road. As usual, A is in front, B is next, C is behind B, and D is behind C. At this instant, A is 1 km ahead of C, B is 4 times as far from A as she is from C, and D is also 4 times as far from A as she is from C. What is the distance, in km, between B and D? Express the answer as a common fraction. 2. _____ km

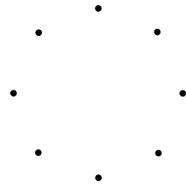


3. What is the value of $9515 \times 1595 - 9595 \times 1515$? 3. _____

4. What is the number of “digits” used when 5040 is written in base 2 (binary) notation? (For example, when 4 is written in base 2, the number of “digits” is 3.) 4. _____ “digits”

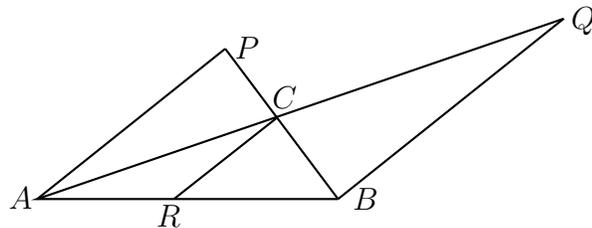
Co-op, Page 2: Team answers must be on the *coloured* page.
 Answers on a white page will not be graded.

5. The 8 points below are the vertices of a regular octagon. How many right-angled triangles are there whose 3 vertices are chosen from these 8 points? 5. _____



6. In the “Prime Challenger” competition, there are 10 questions. Each team gets an automatic n^2 points on the n -th question, whether or not the team answers the question correctly. Thus on Question 1, it gets an automatic 1 point, on Question 2 an automatic 4 points, and so on. In addition, each team gets 1 point for every correct answer. What is the highest prime score that a team can get? 6. _____

7. In the picture, ABC is a triangle, and R is a point on the line segment AB . The point P is on BC extended, with AP parallel to RC . Similarly, Q lies on AC extended, with BQ parallel to RC . Given that $AP = 5$ and $BQ = 6$, what is the length of the line segment RC ? Express the answer as a common fraction. 7. _____ units



Co-op, Page 3: Team answers must be on the *coloured* page.
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8. What is the smallest positive integer n such that the leftmost digit in the decimal representation of 2^n is equal to 7? Hint: $2^{10} = 1024$. 8. _____
9. There is a group of 7 women and m men arranged around a circular table so that the number of people whose right-hand neighbour is of the same sex is the same as the number of people whose right-hand neighbour is of the opposite sex. What is the largest possible value of m ? 9. _____
10. Let $A(n) = \frac{n(3n-1)}{2}$. What is the smallest integer $n > 1$ such that $A(n)$ is a perfect square? 10. _____