Blitz, Page 1

1. Round $\sqrt{2014}$ to the nearest integer.

1. _____

2. 24 is how many percent of 160?

2. _____ percent

3. You throw 2 dice and the sum is 4. What is the probability that one of the dice shows a 1? Express the answer as a common fraction.
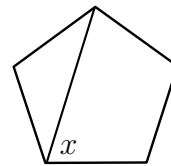
3. _____

4. What is the average of the numbers -15, -12, -5, 1, 6, 12, and 20?

4. _____

5. What is the value, in degrees, of the angle x in the regular pentagon below?

5. _____ degrees

6. If $x^2 - y^2 = x + y = 889$, then what is the value of $x - y$?

6. _____

7. The clock shows a time of 12:20. What is the obtuse angle, in degrees, formed by the 2 hands of the clock?

7. _____ degrees

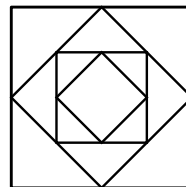8. Calculate $(3-4)+(6-7)+(9-10)+(12-13)+\cdots+(999-1000)$.

8. _____

9. Evaluate $\left(\sqrt{ab}-\sqrt{\dfrac{a}{b}}\right)\div\sqrt{\dfrac{a}{b}}$ when $a=17$ and $b=13$.

9. _____

10. Tax on restaurant bills is 10% and gratuity is usually 15% on the pre-tax amount. Ellen made the mistake of calculating her tip as 15% of the post-tax amount. What was the effective pre-tax percentage of her tip? Express the answer as a percent, correct to 1 place after the decimal point.

10. _____ percent

11. Two fair dice are rolled. What is the probability of not getting a 6 on either die? Express the answer as a common fraction.

11. _____

12. If $\dfrac{5x-4}{3}-\dfrac{x-10}{4}=\dfrac{x+9}{2}-3$, what is the value of x? Express the answer as a common fraction.

12. _____

13. Consider the object below made up of four squares. Each square fits exactly within and is rotated 45 degrees with respect to the next larger square. If each side of the largest square is 400 cm and many more squares could be drawn, what would be the perimeter of the 7th largest square?

13. _____ cm

14. George's father is 30 years older than George, and is half of his father's age. If the sum of the ages of all three is 138 years, how old is George?

14. _____ years old

15. A wall of a room has width 5.1 metres and height 2.4 metres. Four large identical-sized pictures cover exactly 1/3 of the area of the wall. If the vertical dimension of each is 120 cm, what is the horizontal dimension of each of the pictures (in cm)?

15. _____ cm

16. Simplify $\sqrt{50} - 5\sqrt{8} + \sqrt{2} + \sqrt{512}$. Your answer should have the shape $a\sqrt{2}$ where a is an integer.

16. _____

17. A class of 30 students had a picnic. 20 had pizza, 19 had potato chips, and 18 had carrot sticks. 15 of the students had all three items, and 3 of the students had none of the items. How many of the students had exactly two items?.

17. _____ students

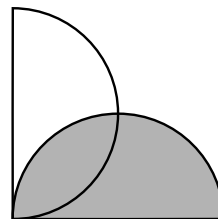18. The sum of three consecutive multiples of three is 63. What is the product of these numbers?

18. _____

19. .Given $N = aa1 + bb1 + 1bb$, where $aa1$, $bb1$, and $1bb$ are three-digit natural numbers and $a < b$. Determine $b - a$ if $N = 696$.
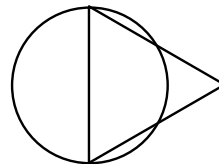
19. _____

20. Each of the two semicircles below has radius 6. Their diameters have an endpoint in common, and are perpendicular to each other . What is the area of the *unshaded* region?
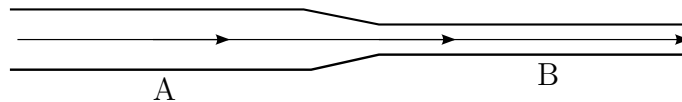
20. _____ units^2

21. A marathon cross-country skier skis at an average speed of V_1 km/hr. He skis 1/3 of the distance at 10 km/hr, 1/3 at 15 km/hr, and 1/3 at 20 km/hr. If he skied each of the segments faster by 10 km/hr, his average speed would rise to V_2 km/hr. What is the ratio $\dfrac{V_2}{V_1}$? Express the answer as a common fraction.

21. _____

22. From a group of 6 boys and 5 girls, a delegation of 3 students is chosen, of whom at least one is a girl. In how many ways can this be done?

22. _____ ways

23. Let $\mathcal{A}$ be the set of all integers from 1 to 2014 (inclusive). What is the largest number of integers that can be chosen from $\mathcal{A}$ so that none is a multiple of 2, 3, or 5?

23. _____ integers

24. Suppose that a, b, and c are real numbers, and $P(x) = ax^2 + bx + c$. If $P(x+2) + P(x+1) - P(x) = 2x^2 + 15x + 20$, what is the value of $P(10)$?

24. _____

25. Alan rolled two fair dice, then Beti rolled the two dice. What is the probability that at least one of the numbers Beti got matches a number that Alan got? Express the answer as a common fraction.

25. _____

26. A diameter of a circle is one of the sides of an equilateral triangle. What fraction of the triangle is inside the circle? Give your answer as $\frac{M+\sqrt{N}\pi}{K}$, where M, N, and K are integers, and N has no square factor greater than 1.

26. _____

Bull's-eye, Page 1: Problem Solving

1. Alphonse, Beti, and Gamal each have different amounts of money. If Alphonse had 3/2 as much money as he has, and Beti had 2/3 as much as she has, and Gamal's fortune was unchanged, they would each have the same amount of money. What common fraction of their total current combined amount of money does Gamal have?

   1. _____

2. A pipe has radius r at point A and has radius $r/2$ at point B. Water flows through the pipe. Its speed at point A is 5m/sec. What is the speed of the water through the pipe at B?

   2. _____ m/sec

3. In the election for Student Council president, there were four candidates, A, B, C, and D. Each of the 1000 students voted for one and only one of these candidates. Candidate A got 40 more votes than candidate B, 200 votes more than C, and 300 more votes than D. How many votes did A get?

   3. _____ votes

4. You ride your bike by starting from rest and increasing your speed at a constant rate. You reached 169/196 of the distance 23 seconds before you reached your final destination. If you travelled 15 metres in your first 23 seconds, how long (in metres) was your entire travel distance? Hint: Total distance travelled at any instant is proportional to the square of the time travelled up to that point.

   4. _____ metres

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

5. Find the largest prime factor of $12! + 14!$.

5. _____

6. Simplify $\dfrac{7! \times 5!}{10!} \left(\dfrac{9!}{3! \times 5!} - \dfrac{10!}{2! \times 7!} \right)$.

6. _____

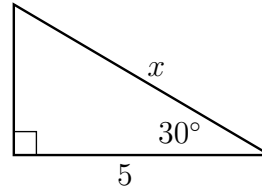7. You start writing down the positive integers in order as follows:

$$1, 2, 3, 4, \ldots, 9, 10, 11, \ldots, 99, 100, 101, \ldots.$$

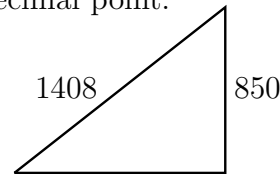In what number will you write down your 2014-th digit?

7. _____

8. A fair coin was tossed 5 times, and you know that at least 3 of the tosses were heads. What is the probability all 5 tosses were heads? Express the answer as a common fraction.

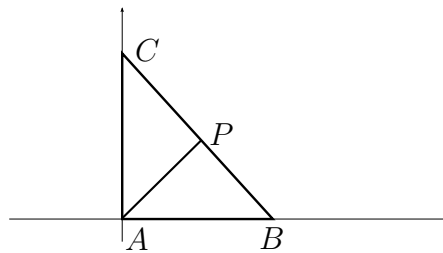8. _____

Bull's-eye, Page 3: Geometry

9. What is the value of x? Express the answer as $\frac{a\sqrt{d}}{b}$, where a and b are positive integers with no common factor greater than 1, and d is an integer which is not divisible by any perfect square > 1.
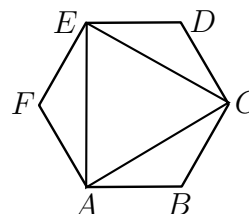
9. _____

x

$30°$

5

10. A gondola travels up the Grouse Grind. The gondola travels on the hypotenuse of the triangle below. The elevation gain of the Ground Grind is approximately 850 m. The travel distance of the gondola is 1408 m. The gondola travels about 32 m every 15 seconds. As the gondola travels, what is the average elevation gain rate in m/sec? Round your answer to the 1 place after the decimal point.

10. _____ m/sec

1408 850

11. The triangle ABC has vertices $A(0,0)$, $B(20,0)$ and $C(0,21)$. The point $P(a,b)$ is on BC and AP is perpendicular to BC. What is the length of AP? Express the answer as a common fraction.

11. _____ units

C

P

A B

12. $ABCDEF$ is a regular hexagon with side 1. What is the area of equilateral triangle ACE? Express the answer as $\frac{a\sqrt{d}}{b}$, where a and b are positive integers with no common factor greater than 1, and d is an integer which is not divisible by any perfect square > 1.

12. _____ units^2

E D

F C

A B

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

1. If $(3 - \sqrt{2})^2$ is expressed in the form $a - b\sqrt{2}$, where a and b are integers, what is the value of $a + b$?

1. _____

2. A block of Swiss cheese occupies a volume of 60 cm^3. It has four equal-sized spherical air bubbles within it and therefore only 80% of that volume is actually cheese. What is the diameter, in cm, of each bubble? Give the answer correct to 2 decimal places.

2. _____ cm

3. Alan, Bono, Camila, and Deidra competed for the position of president of the community association. The person who finishes last in a round of votes is eliminated, and those who voted for him or her transfer their vote to one of the other candidates still left in the race. The process continues until one candidate gets more than 50% of the votes. Results of Round One: 240 voted for Alan, 260 for Bono, 270 for Camila, and 230 for Deidra. In Round Two 1/23 of those voted for the person who was just eliminated (Deidra) transferred their vote to the person who was leading on the first round, and the other two candidate each got 11/23 of the votes. In Round Three the transfer was 25/56 to the winner of Round Two and 31/56 to the person who came second. What is the total number of votes that the winner of the election got?

3. _____ votes

4. A taxi driver pays $124.80 for her taxi for use in her 12-hour shift. All of her other costs (fuel, etc.) add up to $0.17/km. The average fare collected from the passengers is $0.97 per km driven. If she wants to have a net income of $12.00 per hour for her 12 hours shifts, how many km does she need to drive on average during any hour of her shift?

4. _____ km

5. 1000 chicken lay on average 4725 eggs in one week (7 days). How many eggs will a flock of 3500 chicken lay in 1000 days?
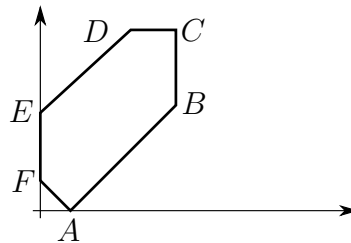
5. _____ eggs

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

6. You got a loan of $10000 at a certain yearly interest. At the end of
   the year you repaid 1/6 of the balance owed (including interest). The
   balance at the beginning of the second year is now $9000. What was
   the yearly interest rate?

   6. _____ percent

7. You can select from the following Canadian coins: 1c, 5c, 10c, 25c,
   1$, 2$. What is the smallest amount (in cents) you cannot make with
   12 or fewer of these coins?

   7. _____

8. The following are the coordinates of the vertices of hexagon $ABCDEF$:
   $A(\sqrt{2}, 0)$, $B(6, 6 - \sqrt{2})$, $C(6, 4 + 3\sqrt{2})$, $D(4, 4 + 3\sqrt{2})$, $E(0, 3\sqrt{2})$,
   $F(0, \sqrt{2})$. Find the area of the hexagon. Express your answer correct
   to 2 decimal places.

   8. _____ units^2

9. There are points inside the hexagon of question 8 which are the fur-
   thest away from any point on the boundary of the hexagon. Find the
   smallest y-coordinate of any such point. Give the answer correct to
   2 decimal places.

   9. _____

10. Find the largest x-coordinate of any point of the type described in
    question 9? Give the answer correct to 2 decimal places.

    10. _____

11. A commercial airplane lands at Vancouver airport (altitude of 0 km).   11. _____ km
It starts its descent from an altitude of 11 km, flying along the hy-
potenuse of the triangle below, which is not drawn to scale. The
airplane reduces its speed at a constant rate from an initial speed of
840 km/hr to 240 km/hr when it touches the ground 37.5 minutes
later. How long is the horizontal distance between the location where
it started its descent and the location where it touches the ground?
Express you answer in km correct to 2 decimal digits.

11

??   YVR

12. A garden has the shape of a right triangle. Its three corners are   12. _____
located at $A(54,0)$, $B(-b,0)$ and $C(0,72)$, where AB is the hy-
potenuse. Three equally long straight garden paths connect the three
corners to $M(x,y)$. What is the value of x?

13. Consider the set $S = \{1, \frac{1}{2}, \frac{1}{3}, \ldots, \frac{1}{24}, \frac{1}{25}\}$. How many ordered triples   13. _____ triples
(a, b, c) of numbers are there such that a, b, and c are in S and
$a - b = c$ and $b \geq c$? Please note that $(1, \frac{1}{2}, \frac{1}{2})$ and $(\frac{1}{2}, \frac{1}{3}, \frac{1}{6})$ are two
such triples.

14. 5 men and 5 women sit at a round table. You know that 3 of the   14. _____
women sit next to each other. If you assume that the other two women
took their seats at random, what is the probability that neither of
these two women sits next to a woman? Express the answer as a
common fraction.

15. The triangle below is right-angled. The two circles have radius 2 and   15. _____ units
1 respectively, and the circles and triangle touch as shown. What is
the length of the hypotenuse? Express the answer as a decimal, to
two places after the decimal point.