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

1. How many of the perfect squares between 1 and 10000 have decimal representation with the units digit equal to 4?

1. _____

2. Let $N$ be the result of multiplying $5^{32}$ by $160^5$. How many zeros does the decimal expansion of $N$ end with?

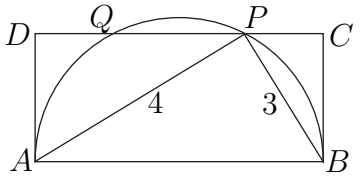
2. _____ zeros

3. In how many ways can a penny, a nickel, a dime, and a quarter be split between Alfie, Beth, and Gimel if each gets at least one coin?

3. _____ ways

4. The picture below (not drawn to scale) shows a rectangle $ABCD$, and a semi-circle with $AB$ as diameter. The semi-circle meets side $CD$ of the rectangle at $P$ and $Q$. If the distance from $A$ to $P$ is 4 units, and the distance from $B$ to $P$ is 3 units, what is the distance from $P$ to $Q$? Express your answer as a common fraction.

4. _____ units



Co-op, Page 2: Team answers must be on the *coloured* page.
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5. A large bottle A contains 300 ml of a solution which is 4% acetic acid and the rest water. Bottle B has 300 ml of a solution which is 12.5% acetic acid and the rest water. How many ml of solution should you transfer from B to A so that after thorough mixing A will contain a solution which is 5% acetic acid?

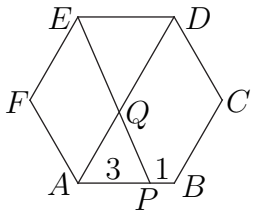
5. _____ ml

6. An integer $n$ is called *square-free* if 1 is the only perfect square that divides $n$. (The first few square-free integers are 1, 2, 3, 5, 6, 7, 10, 11, and 13.) What is the 100th square-free positive integer?

6. _____

7. The figure $ABCDEF$ below is a regular hexagon, and point $P$ lies on side $AB$, with $AP = 3$ cm and $PB = 1$ cm. Line $PE$ meets $AD$ at $Q$. What is the ratio of the area of quadrilateral $AQEF$ to the area of hexagon $ABCDEF$? Express your answer as a common fraction.

7. _____



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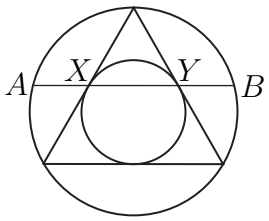
8. There are integers $a$ and $b$ such that $(1+\sqrt{2})^{16} = a + b\sqrt{2}$. What is the value of $a$? 8. _____

9. In the picture below, an equilateral triangle is inscribed in the large circle, and the smaller circle is inscribed in the equilateral triangle. Let $X$ and $Y$ be two of the points at which the smaller circle is tangent to the equilateral triangle. Suppose the line through $X$ and $Y$ meets the larger circle at $A$ and $B$. What is the value of $\frac{AB}{XY}$? 9. _____




10. Halfy, Perfect, and Thirdy are mathematicians who participate in a target shooting competition to win a gold coin. When they shoot at the target, Halfy hits it 1/2 of the time, Perfect hits it all the time, and Thirdy only hits it 1/3 of the time. They have a total of 5 bullets. 10. _____

    Halfy shoots first. If he hits, he eliminates one of the other two from the competition (at his choice, so as to maximize his chance of winning the gold). Next goes Perfect (if he was not eliminated already). He hits the target, and eliminates any of the other competitors still left (in a way that maximizes his chance of winning the gold). Then Thirdy gets a turn (if he was not eliminated already), and so on, until two of the three are eliminated *or* the 5 bullets are all gone. If two of the three are eliminated, the last remaining person wins the gold. If they run out of bullets before a winner is declared, no one wins the gold. What is the probability that no one wins the gold? Express your answer as a common fraction.