

1. Evaluate n^2+n+41 at $n=41$.

2. How many remainder cases are needed for division by 3?

3. If $p=2r$ and $p^2=2q^2$, what coefficient multiplies r^2 in q^2 ?

4. For $2a+1$ and $2b+1$ with $a=3,b=4$, find their sum.

5. What remainder does 8^2 have on division by 3?

6. The product of any finite list of primes plus one is always prime.

☐ True ☐ False
7. Checking the first ten integers proves a claim for every positive integer.

☐ True ☐ False
8. If a claim works for the first hundred integers, it has been proved for all integers.

☐ True ☐ False
9. In the $\sqrt{2}$ proof, why does $p^2=2q^2$ force p to be even?

☐ Because q is odd

☐ Even numbers have no square roots

☐ p^2 is even, and an odd square $(2r+1)^2=4r(r+1)+1$ is odd, so p cannot be odd
10. Why does $n=41$ disprove " n^2+n+41 is prime for every positive integer n "?

☐ It is a single valid case where the value $1763=41\times43$ is not prime

☐ Because 41 is itself prime

☐ Because the first forty cases failed

1. **1763.0**

At $n=41$ the value is $41^2+41+41=41\times43=1763$.
2. **3.0**

The possible remainders are 0,1,2, giving three cases.
3. **2.0**

 $4r^2=2q^2$, so $q^2=2r^2$.
4. **16.0**

The two odd integers are 7 and 9, whose sum is 16.
5. **1.0**

 $64=3\times21+1$.
6. **False**

The even-square step needs a reason: an odd integer $2r+1$ has odd square $4r(r+1)+1$. The prime proof needs a new prime divisor, not a claim that product-plus-one is always prime. A contradiction must attack the stated assumption.
7. **False**

Do not assume the conclusion while proving it. In contradiction, identify the impossible consequence and reject the initial contrary assumption. Induction is not compulsory in AQA 7357; it belongs in its own appropriate further-mathematics scope.
8. **False**

A finite sample is not exhaustion unless it contains every possible case. Checking $n=0,1,2$ alone is not enough: the expressions involving arbitrary integer k justify all integers.
9. **p^2 is even, and an odd square $(2r+1)^2=4r(r+1)+1$ is odd, so p cannot be odd**

 $p^2=2q^2$ makes p^2 even; since odd integers square to odd results, p itself must be even. Writing $p=2r$ then forces $q^2=2r^2$, so q is even too - contradicting coprimality.
10. **It is a single valid case where the value $1763=41\times43$ is not prime**

A universal claim falls to one counterexample. At $n=41$ the value is 41×43 , divisible by 41, so not prime - no further cases are needed.