

## Solution Sheet 10, July 30, 2012

### Answers

1. 1012101, and python code...

```
ctr=0
n=0
nmax=input("Enter index of palindromic number: ")
while ctr<nmax:
    mstr=str(n)
    if mstr==mstr[::-1]:
        ctr+=1
    n+=1
print(str(ctr) + "th palindromic number is " + mstr)
```

- 2.

3. for positive integers  $p; q$ ,

$$\frac{p}{\sqrt{p}} - \frac{q}{\sqrt{q}} = \frac{p-q}{\sqrt{p} + \sqrt{q}}$$

4. (a)  $29 = 5^2 + 2^2; 37 = 6^2 + 1^2$ . For 30, note that none of the following are square numbers:

$$30 - 1 = 29; 30 - 4 = 26; 30 - 9 = 21; 30 - 16 = 14; 30 - 25 = 5$$

Similarly, 31 cannot be expressed as a sum of two squares.

- (b) easy

(c)  $1073 = (5^2 + 2^2)(6^2 + 1^2) = (30 - 2)^2 + (5 + 12)^2$ . Swapping  $5^2 + 2^2$  with  $2^2 + 5^2$  yields  $1073 = 7^2 + 32^2$ .

5. Divide the grid into nine  $1 \times 1$  squares. If ten darts are thrown, at least one square contains at least two darts. These darts are less than  $\sqrt{2}$  from each other.