(*a*) State the conditions under which the normal distribution may be used as an approximation to the binomial distribution.

**(2)**

A company sells seeds and claims that 55% of its pea seeds germinate.

(*b*) Write down a reason why the company should not justify their claim by testing all the pea seeds they produce.

**(1)**

To test the company’s claim, a random sample of 220 pea seeds was planted.

(*c*) State the hypotheses for a two-tailed test of the company’s claim.

**(1)**

Given that 135 of the 220 pea seeds germinated,

(*d*) use a normal approximation to test, at the 5% level of significance, whether or not the company’s claim is justified.

**(7)**

**Total 11 marks**

**S2 June 2014 qu.5**

**Mark scheme**

|  |  |  |
| --- | --- | --- |
| Question Number | Scheme | Marks |
| **5.(a)** | *n* is large and *p* close to 0.5 | B1B1 (2) |
| **(b)\*** | There would be no pea seeds left | B1 (1) |
| **(c)** | H0: *p* = 0.55 H1 : *p* ≠ 0.55 | B1 (1) |
| **(d)** | *X*~N(121, 54.45) | B1 |
|  | P(*X* ≥ 134.5) =  or 1.96 | M1M1A1 |
|  | = P( Z ≥ 1.8295..) |  |
|  | = 1 – 0.9664 |  |
|  | = 0.0336/0.0337 *x* = 135.96 | A1 |
|  |  |  |
|  | Accept H0 not in CR, not significant | M1 |
|  | The **company’s claim** is justified **or** **55**% of its pea **seeds germinate** | A1cso |
|  |  | (7) |
|  | **Alternative** |  |
|  | *X*~N(99, 54.45) | B1 |
|  | P(*X* ≤ 85) = or 1.96 | M1 M1 A1 |
|  | = P( Z ≥ 1.8295..) |  |
|  | = 1 – 0.9664 |  |
|  | = 0.0336/0.0337 *x* = 107.5 |  |
|  |  |  |
|  | Accept H0 not in CR, not significant | M1 |
|  | The **company’s claim** is justified **or** **55**% of its pea **seeds germinate** | A1cso  [11] |

Parts (b), (c) and (d) assess spec point 8 Introduction to hypothesis testing.

\*Part (b) is AO3