

QUESTION 12

While preparing for the 2010 Soccer World Cup, a group of investors decided to build a guesthouse with single and double bedrooms to hire out to visitors. They came up with the following constraints for the guesthouse:

- There must be at least one single bedroom.
- They intend to build at least 10 bedrooms altogether, but not more than 15.
- Furthermore, the number of double bedrooms must be at least twice the number of single bedrooms.
- There should not be more than 12 double bedrooms.

Let the number of single bedrooms be x and the number of double bedrooms be y .

- 12.1 Write down the constraints as a system of inequalities. (6)
- 12.2 Represent the system of constraints on the graph paper provided on DIAGRAM SHEET 3. Indicate the feasible region by means of shading. (7)
- 12.3 According to these constraints, could the guesthouse have 5 single bedrooms and 8 double bedrooms? Motivate your answer. (2)
- 12.4 The rental for a single bedroom is R600 per night and R900 per night for a double bedroom. How many rooms of each type of bedroom should the contractors build so that the guesthouse produces the largest income per night? Use a search line to determine your answer and assume that all bedrooms in the guesthouse are fully occupied. (3)

[18]

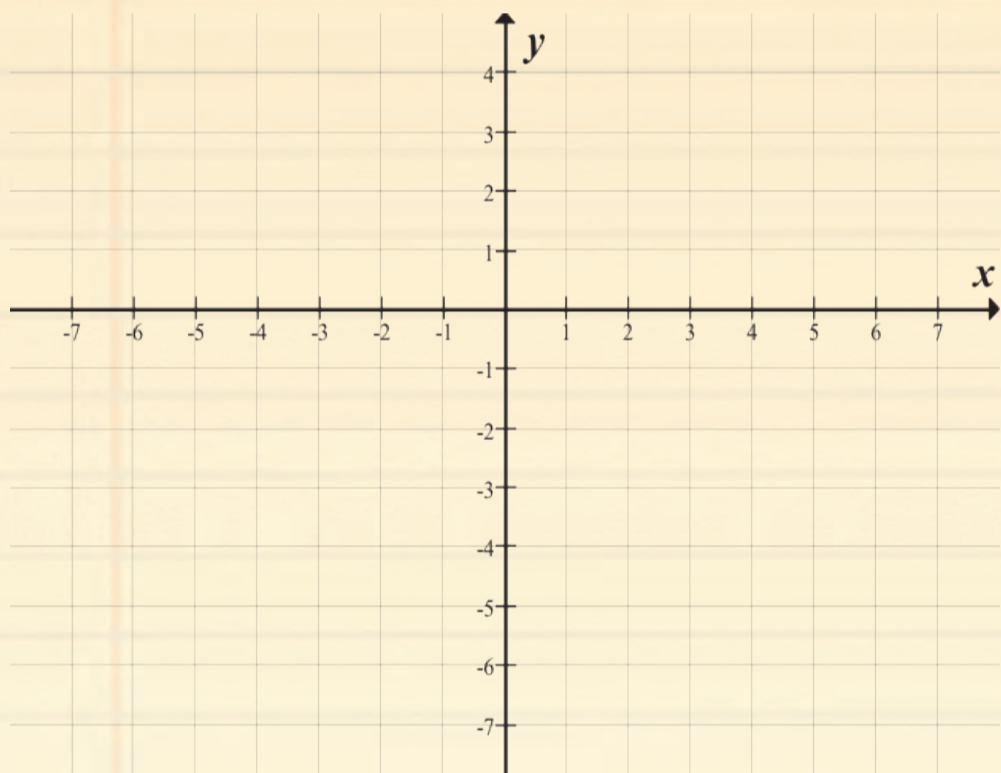
TOTAL:150

CENTRE NUMBER:

EXAMINATION NUMBER:

DIAGRAM SHEET 1

QUESTION 5.3

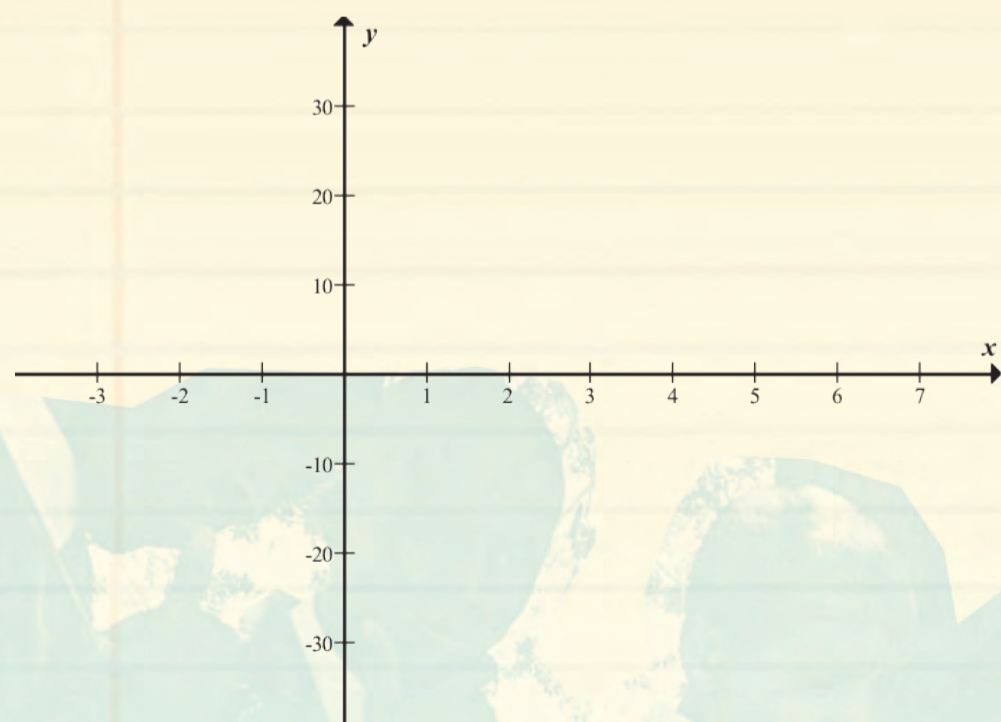


CENTRE NUMBER:

EXAMINATION NUMBER:

DIAGRAM SHEET 2

QUESTION 10.4

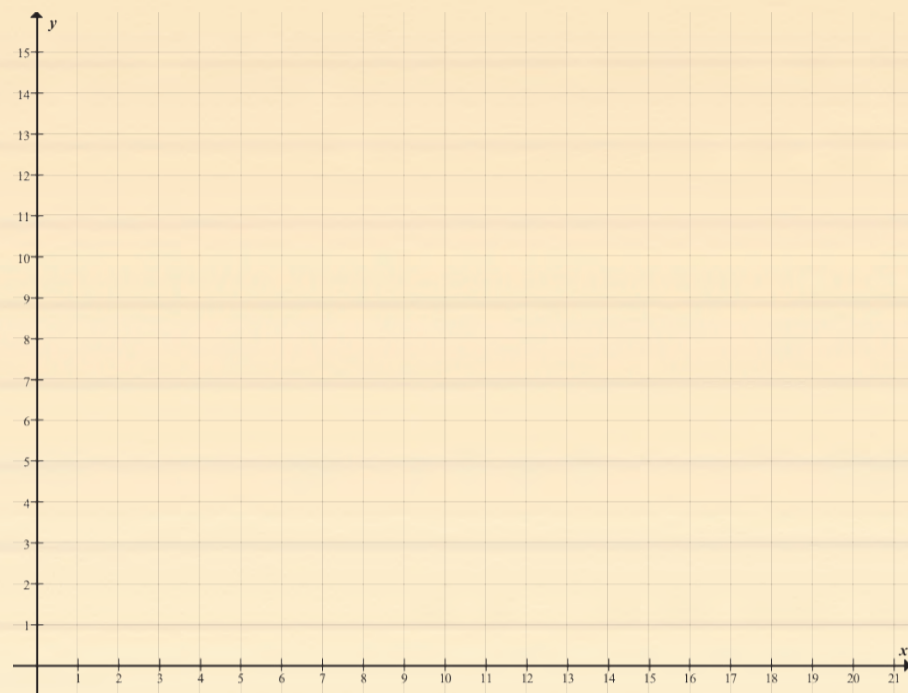


CENTRE NUMBER:

EXAMINATION NUMBER:

DIAGRAM SHEET 3

QUESTION 12.2



INFORMATION SHEET: MATHEMATICS

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + ni) \quad A = P(1 - ni) \quad A = P(1 - i)^n \quad A = P(1 + i)^n$$

$$\sum_{i=1}^n 1 = n \quad \sum_{i=1}^n i = \frac{n(n+1)}{2} \quad T_n = a + (n-1)d \quad S_n = \frac{n}{2}(2a + (n-1)d)$$

$$T_n = ar^{n-1} \quad S_n = \frac{a(r^n - 1)}{r - 1} \quad r \neq 1 \quad S_\infty = \frac{a}{1 - r} \quad -1 < r < 1$$

$$F = \frac{x[(1+i)^n - 1]}{i} \quad P = \frac{x[1 - (1+i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$y = mx + c \quad y - y_1 = m(x - x_1) \quad m = \frac{y_2 - y_1}{x_2 - x_1} \quad m = \tan \theta$$

$$(x-a)^2 + (y-b)^2 = r^2$$

In $\triangle ABC$: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \quad a^2 = b^2 + c^2 - 2bc \cos A$

$$\text{area } \triangle ABC = \frac{1}{2} ab \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta \quad \sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta \quad \cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$$

$$\cos 2\alpha = \begin{cases} \cos^2 \alpha - \sin^2 \alpha \\ 1 - 2\sin^2 \alpha \\ 2\cos^2 \alpha - 1 \end{cases} \quad \sin 2\alpha = 2 \sin \alpha \cos \alpha$$

$$(x; y) \rightarrow (x \cos \theta + y \sin \theta; y \cos \theta - x \sin \theta) \quad (x; y) \rightarrow (x \cos \theta - y \sin \theta; y \cos \theta + x \sin \theta)$$

$$\bar{x} = \frac{\sum fx}{n} \quad \sigma^2 = \frac{\sum (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)} \quad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx \quad b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$