

CS/MATH 111, Discrete Structures - Fall 2018.

Discussion 1 - Review

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Outline

Logic

Counting

Factoring

Quadratic Equations

Cubic Equations

Logic

For sentences (a) and (b), tell which of the sentences (i)-(v) is **equivalent** to it.

(a) **“If X is green or pink, then X is a vegetable.”**

- (i) “X is green and X is a vegetable.”
- (ii) “X is not green and X is not a vegetable.”
- (iii) “X is not green or X is a vegetable.”
- (iv) “X is not green and X is a vegetable.”
- (v) None of the above.

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- (iv) “X is not green and X is a vegetable.”
- (v) **None of the above.**

Logic

For sentences (a) and (b), tell which of the sentences (i)-(v) is **equivalent** to it.

(b) **“X is a pig, and Y or Z is a bird.”**

- (i) “Either X is not a pig, or Y and Z are not birds.”
- (ii) “Either X is a pig and Y is a bird, or X is a pig and Z is a bird.”
- (iii) “X is not a pig, and neither Y nor Z is a bird.”
- (iv) “X is a pig, and both Y and Z are birds.”
- (v) None of the above.

Logic

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- (v) None of the above.

Logic

For sentences (c), (d), and (e), tell which of the sentences (i)-(v) is its **negation**.

- (c) “ $\forall x \exists y : y < x^2 + 17$ ”
- (i) “ $\forall x \exists y : y \geq x^2 + 17$ ”
 - (ii) “ $\forall y \exists x : x^2 + 17 < y$ ”
 - (iii) “ $\exists x \exists y : y > x^2 + 17$ ”
 - (iv) “ $\exists x \forall y : y \geq x^2 + 17$ ”
 - (v) None of the above.

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 - (v) None of the above.

Logic

For sentences (c), (d), and (e), tell which of the sentences (i)-(v) is its **negation**.

- (d) **“Some of us can write but cannot spell.”**
- (i) “All of us cannot write and can spell.”
 - (ii) “Some of us cannot write but can spell.”
 - (iii) “Some of us can spell but cannot write.”
 - (iv) “All of us either can spell or cannot write.”
 - (v) None of the above.

Logic

For sentences (c), (d), and (e), tell which of the sentences (i)-(v) is its **negation**.

- (d) **“Some of us can write but cannot spell.”**
- (i) “All of us cannot write and can spell.”
 - (ii) “Some of us cannot write but can spell.”
 - (iii) “Some of us can spell but cannot write.”
 - (iv) **“All of us either can spell or cannot write.”**
 - (v) None of the above.

Logic

For sentences (c), (d), and (e), tell which of the sentences (i)-(v) is its **negation**.

(e) **“For any X, if X moos then X is a cow.”**

- (i) “There exists an X that moos and is not a cow.”
- (ii) “There is no X that does not moo and is not a cow.”
- (iii) “For any X, X does not moo and X is not a cow.”
- (iv) “For any X, if X does not moo then X is not a cow.”
- (v) None of the above.

Logic

For sentences (c), (d), and (e), tell which of the sentences (i)-(v) is its **negation**.

- (e) **“For any X, if X moos then X is a cow.”**
- (i) **“There exists an X that moos and is not a cow.”**
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 - (iii) “For any X, X does not moo and X is not a cow.”
 - (iv) “For any X, if X does not moo then X is not a cow.”
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Outline

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Counting²

Let X be a set of 10 distinct items. Give formulas for the following quantities¹.

(a) What is the total number of subsets of X ?

¹you do not have to compute any value.

²<https://tinyurl.com/yd5xdnab>

Counting

Let X be a set of 10 distinct items. Give formulas for the following quantities:

(a) What is the total number of subsets of X ?

$$2^{10}$$

Counting

Let X be a set of 10 distinct items. Give formulas for the following quantities:

- (b) In how many ways we can choose 6 items from X if the items in the choices are ordered and repetition is not allowed?

Counting

Let X be a set of 10 distinct items. Give formulas for the following quantities:

- (b) In how many ways we can choose 6 items from X if the items in the choices are ordered and repetition is not allowed?

$$P(10, 6) = \frac{10!}{4!}$$

Counting

Let X be a set of 10 distinct items. Give formulas for the following quantities:

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$$P_{rep}(10, 6) = 10^6$$

Counting

Let X be a set of 10 distinct items. Give formulas for the following quantities:

- (d) In how many ways we can choose 6 items from X if the items in the choices are not ordered and repetition is not allowed?

Counting

Let X be a set of 10 distinct items. Give formulas for the following quantities:

- (d) In how many ways we can choose 6 items from X if the items in the choices are not ordered and repetition is not allowed?

$$C(10, 6) = \frac{10!}{6!4!}$$

Counting

Let X be a set of 10 distinct items. Give formulas for the following quantities:

(e) In how many ways we can order X ?

Counting

Let X be a set of 10 distinct items. Give formulas for the following quantities:

(e) In how many ways we can order X ?

$$P(10, 10) = 10!$$

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Quadratic equations³

- ▶ Solve $x^2 + 5x + 6 = 0$

³<https://tinyurl.com/y9j37ltb>

Quadratic equations

► Solve $x^2 + 5x + 6 = 0$

$$x = -3$$

$$x = -2$$

Quadratic equations

- ▶ Solve $x^2 - 6x = 16$

Quadratic equations

► Solve $x^2 - 6x = 16$

$$x = 8$$

$$x = -2$$

Quadratic equations

► Solve $x^2 - 3 = 2x$

Quadratic equations

► Solve $x^2 - 3 = 2x$

$$x = -6$$

$$x = 1$$

Quadratic equations

► Solve $x^2 + 5x = 0$

Quadratic equations

► Solve $x^2 + 5x = 0$

$$x = 0$$

$$x = -5$$

Quadratic equations

► Solve $x^2 - 4 = 0$

Quadratic equations

► Solve $x^2 - 4 = 0$

$$x = -2$$

$$x = 2$$

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Cubic equations⁴

- ▶ Solve $x^3 + 4x^2 + x - 6 = 0$

⁴<https://tinyurl.com/y9cxzt43>

Quadratic equations

► Solve $x^3 + 4x^2 + x - 6 = 0$

$$x = -3$$

$$x = -2$$

$$x = 1$$

Cubic equations

► Solve $x^3 - 4x^2 + 9x - 36 = 0$

Quadratic equations

► Solve $x^3 - 4x^2 + 9x - 36 = 0$

$$x = -3$$

$$x = 3$$

$$x = 4$$

Cubic equations

1. <https://tinyurl.com/y9d62vzs>
2. <https://tinyurl.com/y7jbfqfe>

