Ch 3.1:-

$\{\forall x \in D \mid P(x)\}$

The set of x in D such that P(x)

Q1

7	brown dogs	(a) False
2	black dogs	(b) True
6	gray cats	(c) False
10	black cats	(d) True
5	blue birds	(e) false
6	yellow birds	(f) True
1	black bird	

Q2 (a) True, Real numbers include Rational and irrational nums, and integers are considered to be part of rational nums then they are Real nums

(b) false, 0 is neither positive nor negative

(c) counter example $\Rightarrow r = -2 \Rightarrow -r = +2$ nonnegative number

(d) false, counter example $\Rightarrow r = 2.2 \Rightarrow$ not an integer

Q3 $P(x) \Rightarrow x > \frac{1}{x}$

$P(2) \Rightarrow 2 > \frac{1}{2}$ true

$P(\frac{1}{2}) \Rightarrow \frac{1}{2} > 2$ false

$P(-1) \Rightarrow -1 > -1$ false

$P(-\frac{1}{2}) \Rightarrow -\frac{1}{2} > -2$ true

$P(-8) \Rightarrow -8 > -\frac{1}{8}$ false

(b) $\Rightarrow X > 1$ or $-1 < X < 0$

(c) $\Rightarrow X > 1$

Q4 $n^2 \leq 30$

Q(2) Q(-2) true

Q(7) Q(-7) false

(b) $\{-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5\}$

(c) $\{1, 2, 3, 4, 5\}$

Q5 $x < y \rightarrow x^2 < y^2$

(a) $-2 < 1$ true but $4 < 1$ false

true $\rightarrow$ false : false

(b) $x = -4$, $y = 2$

conclusion is false then the conditional statement is false too

(c) $x < y \Rightarrow 3 < 8$ true

$x^2 < y^2 \Rightarrow 9 < 64$ true

true $\rightarrow$ true : true

$x = 8$

$y = 9$

Q6 if m is a factor of n^2 then m is a factor of n

25 is a factor of 100 but 25 isn't a factor of 10
Premise is true $(10 < 25) \Rightarrow$ false conclusion

Then the conditional statement is false.

b + c + d skip

Q7 (a) $\{1, 2, 3, 6, 1, -2, -3, -6\}$

(b) $\{1, 2, 3, 6\}$

(c) $1 \leq x^2 \leq 4$ $\mathbb{R} \Rightarrow [-2, -1] \cup [1, 2]$

(d) $\{-1, -2, 1, 2\}$

Q8 $-10 < x < 10$

(a) $\{-9, -8, -7, -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$

(b) $Z^+ \Rightarrow \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$

(c) $\Rightarrow \{2, 4, 6, 8, 0, -2, -4, -6, -8\}$

Q9 (a) $x = \frac{1}{2}$

Q10 $a = -1$

Q11 $m = 1, n = 2$

Q12 $x = 1, y = 1$ $\sqrt{2} \neq 2$

Q13 (a) / (e) / (f)

Q14 (b) / (f) / (c) / (e)

Q15 (a) All rectangles are quadrilateral

(b) There is at least one set that has 16 subsets

Q_{16} (a) $\forall x$, dinosaurs $(x) \rightarrow$ extinct (x)

(b) $\forall x \in \mathbb{R}$, positive$(x) \vee$ negative$(x) \vee$ zero (x)

(c) $\forall x$, irrational $(x) \rightarrow \sim$ int(x)

(d) $\forall p \in$ person, logicians $(x) \rightarrow \sim$ lazy (x)

(e) $\forall x \in$ integers, $x^2 \neq 2147581953$

(f) $\forall x \in \mathbb{R}$, $x^2 \neq -1$

Q_{17} (a) $\exists e \in$ exercises such that have answers (e)

or $\exists e$ (exercises $(e) \wedge$ have answ (e))

(b) $\exists x \in \mathbb{R}$ such that rational (x)

Q_{18} $M(s) \rightarrow$ Math major student

$C(s) \rightarrow$ Computer science students

$E(s) \rightarrow$ Engineering students

(a) $\exists s \in$ student such that $(E(s) \wedge M(s))$

(b) $\forall s \in$ student, $C(s) \rightarrow E(s)$

(c) $\forall s \in$ student, $C(s) \rightarrow \sim E(s)$

(d) $\exists s \in$ student such that $(C(s) \wedge M(s))$

(e) $\exists s \in$ student such that $(C(s) \wedge E(s)) \wedge \exists s \in$ student $(C(s) \wedge \sim E(s))$

Q19 (b)/(d)/(e)

(a) → isn't correct

لانو بتحكيلو انو كل ←

ال $(int)^2$ ← even وكل

ال int ← even

Q20 the square root of any positive real number is also positive

Q21 The total degree of G is even, for any . — -

The base angles of T . - - - , for any isosceles...

p is even for some prime numbers p

f isn't diff for some cont functions f

Q22 (a) ∀x, Java(x) → have at least 5(x)

(b) ∀x (valid argument(x) ∧ true premises(x)) → true conclusion(x)

Q23 (a) ∀x, equilateral triangles(x) → isosceles(x)

(b) ∀x∈ computer Science student, Take data stracture(x)

Q24 (a) ∃x∈ hatters, mad(x)

(b) ∃x∈ questions, easy(x)

Q25 ∀x∈ Nonzero fraction, Fraction Reciprocal(x)

(a) ∀x∈ Nonzero fraction ∃y∈ fraction such that xy = 1

ساوي او

(b) ∀x∈ polynomial, Derivative(x) → Poly Derivative(x)

(c) ∀x,y ∈ Angles, (Triangle Angle(x) ∧ Trangle angle(y)) → Sum Is 180(x,y)

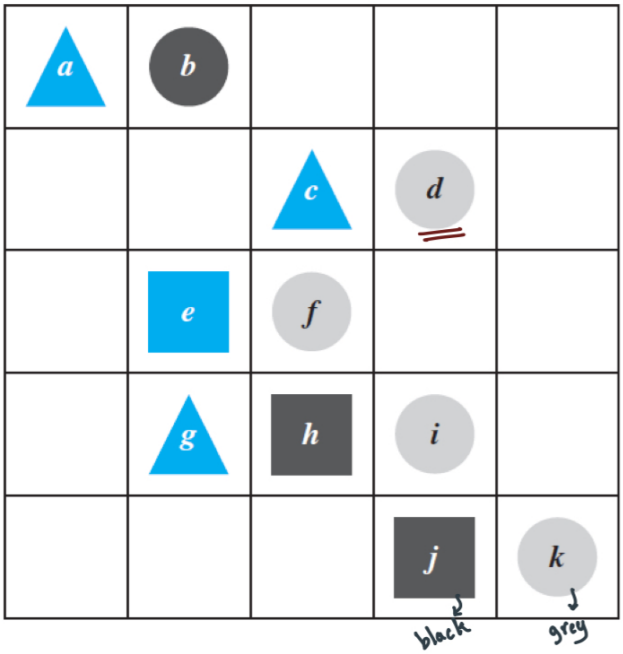
(d) ∀x∈ irrational, irrational negative form(x)

(e) ∀x,y ∈ integers, (even(x) ∧ even(y)) → even(x+y)

(f) ∀x,y ∈ fraction, fraction(x·y)

Q26 $\forall x, (int(x) \rightarrow Rational(x)) \wedge \exists x \in rational$ such that $\neg int(x)$

Q27



(a) false, there is a black circle

(b) true

(c) false

(d) True

Q28

Real (x) → real num
Pos (x) → positive Real num
Neg (x) → Negative Real num
Int(x) → int

(a) zero is a positive Real number
(false → it's neithe negative or positive)

(b) the negative of any negative Real number is a positive Real number
(true)

(c) any integer is a real number (true) ⇒ x = 1 int & real

(d) There is at least on Real num that's not an int (true)
1.2 real but not an int ↵

Q29

(a) true there's a rectangle that is also a square
(b) true there is a rectangle that isn't a square
(c) true all squares are rectangles too

Q_{30} (a) true $\Rightarrow x = 2$

(b) true $x = 2, 3, 5, 7 \ldots$

(c) $x = 25$ true

Q_{31} skip

Q_{32} (a) $x > 2 \Rightarrow x > 1$

true

(b) $x > 2 \Rightarrow x^2 > 4$

true

(c) $x^2 > 4 \Rightarrow x > 2$

false

$x = -3 \Rightarrow x^2 > 4$ but $(-3 > 2)$ X

$9 > 4$

(d) $x^2 > 4 \leftrightarrow |x| > 2$

true

Q_{33}

(a) true

(b) false $\Rightarrow$ $-1 < a < 0$

$-2 < b < 0$

$ab = 2 > 0$

(c) true

(d) $-10 < 1$ $-10 < 1$ false

$(100 < 1)$ X

Ch 3.2

Q1 (a)/(e)

Q2 (c)/(f)/

Q3 a) ∃ fish x... such that x hasn't gills

b) ∃ com.. such that c hasn't

c) ∀ movise , m isn't over

d) ∀ a and b , b hasn't won 10 Gra—

Q4

a) Some dogs aren't —

b) Some people aren't —

c) All s— weren't —

d) All es— aren't ac —

Q5 a) Some v— haven't a true con —

b) Some r— arent positive, aren't negative and aren't zero

Q6 a) Sets A and B have some points

b) Towns P — are connected by some —

Q7 No orders from store A for item B

⇒ universal

There is at least one order from sto—

∀ o ∈ orders , ¬order(A,B)

negation ↳ ∃ o ∈ order , order(A,B)

Q_8 there is at least one simple solution

$\exists S$, Simple Sol(S) $\wedge$ solves problem(S)

Q_9 $\exists$ real num x such that $x > 3 \wedge x^2 \leq 9$

Q_{10} $\exists$ comp prog such that P compiles without error messages and P isn't correct

Q_{11} The "$\forall$" of at least two irrational num is rational (false)

Q_{12} The product of some irrational and some rational num is rational (false)

Q_{13} There is an integer n such that n^2 is even and n is not even (false)

Q_{14} for some real num x_1 and x_2 such that $x_1^2 = x_2^2$ and $x_1 \neq x_2$ (false)

Q_{15} (a) T

(b) T

(c) F $\Rightarrow$ counter example $\Rightarrow$ $x = 16 > 0$ and it's even

(d) T

(e) F $\rightarrow$ $x = 36$ (counter example)

Q_{16} $\exists \mathbb{R}$ x such that $x^2 \geq 1$ and $x \leq 0$

Q_{17} $\exists$ int d such that $\frac{6}{d}$ is an int and $d \neq 3$

Q_{18} $\exists x \in \mathbb{R}$ such that $x(x+1) > 0$ and $x \leq 0$ and $x \geq -1$

(ابرهنو) n is even

Q_{19} $\exists n \in \mathbb{Z}$ such that n is prime and n isn't odd and $n \neq 2$

بسمحلي افصل

Q_{20} $\exists$ int a, b & c, a−b is even and b−c is even and a−c isn't even.

Q_{21} $\exists$ int n, n is divisible by 6 and n isn't div by 2 or n isn't div by 3

Q_{22} a square of an int is odd and the int isn't odd

Q_{23} a function is diff & it isn't cont
or There exist at least one function

Q_{24} (a) $\forall C$, ChildrenInTom'sFamily(C) $\rightarrow$ female(C)
$\forall C$, FemaleInTom'sFamily(C) $\rightarrow$ Children(C) } converse

(b) $\forall x \in$ int, $x > 5 \wedge$ end with 1 or 3 or 7 or 9 (X) $\rightarrow$ prime(X)
$\forall x \in$ int, $x > 5 \wedge$ prime(X) $\rightarrow$ end with 1 or 3 or 7 or 9 (X)] converse

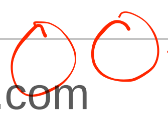
بس مش كثير منطقية skip

Q_{25} if n+1 is even then n is any prime ---

(a) $n=1 \Rightarrow n+1=2$ even ☑
but n=1 isn't a prime num } → نبعد عن الواحد لانو مشكوك فيه (لهادا مبدئي بس انو احتمال)
or n=9 9+1 = 10 → even
but 9 isn't a prime num

(b) if 2m is even then m is any odd int
2×4 = 8 even
but m=4 ⇒ it's not odd

(c) if 2 ● don't have a common center then they intersect in exactly 2 points

 → don't have same center and don't intersect

Q26 – Q33 skip (easy enchallah)

Q34 a) if n is div by some prime num between 1 and $\sqrt{n}$ strictly then n isn't prime

b) if A and B aren't disjoint then A and B have some elements in common

Q35 skip

Q36 skipppp

Q37 $\forall X \in int, (X=1 \wedge SequenceHas(X) \rightarrow LeftOf(X,0))$

we can't determine since we can't decide wether the premise is true or not

$\neg(\forall X \in int, (X=1 \wedge SequenceHas(X) \rightarrow LeftOf(X,0)))$

$\exists X \in int, (X=1 \wedge SequenceHas(X) \wedge \neg LeftOf(X,0))$

↳ this is false since the sequence doesn't contain 1

→ the negation is false

Then the statement itself is true.

Q38 $\forall X \in characters, isU\ occurs\ In\ DiscreteMathematics(X) \rightarrow lowercase(X)$

$\exists X \in chr, Uoccurs(X) \wedge \neg lowercase(X)$

⇒ U doesn't occur then the negation is false

⇒ so the statement is true

$Q_{39} - Q_{48}$ easy (skip)