Answer Key

1a. $P(2)$: False
$P(23)$: True
$P(-5)$: False
$P(15)$: False

1b. $Q(2)$: True
$Q(23)$: False
$Q(-5)$: True
$Q(15)$: True

1c. $R(2)$: False
$R(23)$: False
$R(-5)$: False
$R(15)$: True

2a. True for some

2b. True for all

2c. True for none

2d. True for all

3a. $P(x)$ is the predicate "$x > 15$", the domain is {10, 12, 14, 16, 18}.
$\exists x in D, P(x)$

3b. $Q(x)$ is the predicate "$x \leq 15$", the domain is {0, 1, 2, 3}.
$\forall x in D, Q(x)$

3c. $R(x)$ is the predicate "$(x > 5) \wedge (x < 20)$", the domain is {0, 1, 2}.
$\forall x in D, \neg R(x)$

3d. $S(x)$ is the predicate "$(x > 1) \wedge (x < 5)$", domain is {2, 3, 4}.
$\forall x in D, S(x)$

4a. $\exists k \in D, P(x)$, where $P(x)$ is the predicate "$k^2 \in D$".

4b. $\exists m \in D, Q(x)$, where $Q(m)$ is the predicate "$m \geq 3$".

5a. $\neg Q(n)$ is $n \leq 10$, so {2, 4, 6, 8, and 10}.

5b. $\neg R(n)$ is n is odd, so NONE.

5c. $\neg S(n)$ is $n^2 \geq 1$, so ALL.

5d. $\neg T(n)$ is $n - 1$ is not an element of D, so $\{2\}$.