

Math 30 – 2 Logical Reasoning Review

Key.

Choose the best answer for all multiple choice questions. Place numeric response answers on the numeric response answer sheet. Always begin your answers on the left, and leave empty spaces on the right.

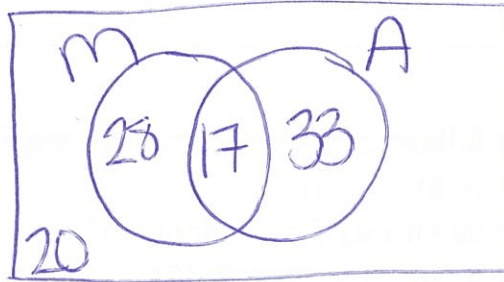
Use this information to answer the next 4 questions.

Students in a particular high school were surveyed to determine the subjects in which they were currently enrolled. The table below represents the data that was collected.

Courses Enrolled In	Number of Students
Math only	28
Art only	33
Math and Art	17
Neither course	20

1) The number of students in the universal set is

- A. 61
- B. 64
- C. 78
- D. 98



Numerical Response

1.

The number of students taking Art is 50.

Numerical Response

2.

The number of students not taking Math is 53.

2) The number of students taking math or art is

- A. 17
- B. 61
- C. 78
- D. 98

3) The set $\{S\}$ is the set of all multiples of seven, less than 30. Which of the following is **not** a subset of S ?

$$S = \{7, 14, 21, 28\}$$

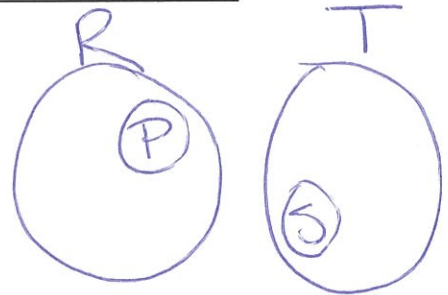
- A. $\{0, 7\}$
- B. $\{28\}$
- C. $\{21, 28\}$
- D. $\{7, 14, 21\}$

Use this information to answer the next 3 questions.

In the universal set $\{U\}$, the sets $\{R\}$ and $\{T\}$ are disjoint. Set $\{S\}$ is a subset of $\{T\}$ and set $\{P\}$ is a subset of $\{R\}$.

4) Which of the following examples **could** be sets R and T ?

- A. $R = \{1, 4, 6, 8\}$, $T = \{1, 3, 5, 7\}$
- B. $R = \{\text{even numbers}\}$, $T = \{\text{multiples of } 4\}$
- C. $R = \{2, 6, 8, 10\}$, $T = \{0, 4, 9, 12\}$
- D. $R = \{\text{even numbers}\}$, $T = \{0\}$



5) "Sets S and P are disjoint." The truth value of this statement is:

- A. True
- B. False
- C. It is impossible to know without seeing the elements of T and P .

If P is in R and S is in T and R and T are disjoint, then P and S are disjoint.

Numerical Response

3.

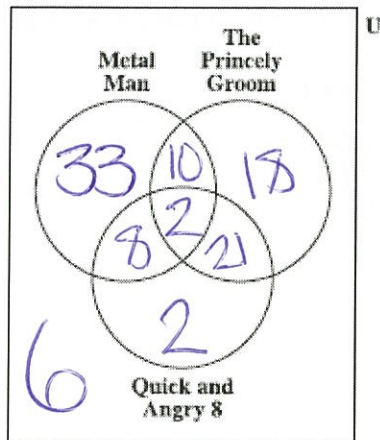
If there are 4 elements in set R , then the maximum number of elements in set P is 4.

Use this information to answer the next 3 questions.

A group of 100 students was surveyed about movies that they have seen, as shown below.

- 2 people saw all three movies
- 12 people saw "Metal Man" and "The Princely Groom"
- 53 people saw "Metal Man"
- 10 people saw "Metal Man" and "Quick and Angry 8"
- 18 people saw "The Princely Groom" only
- 23 people saw "The Princely Groom" and "Quick and Angry 8"
- 6 people did not see any of the movies

Jason started to organize the results in the Venn diagram shown below.



6) The number of people who saw "The Princely Groom" is

- A. 18
- B. 20
- C. 51
- D. 53

7) The number of people who saw "Metal Man" only is

- A. 20
- B. 33
- C. 51
- D. 53

8) The number of people who saw "Metal Man" or "Quick and Angry 8" is

- A. 10
- B. 43
- C. 76
- D. 98

Use this information to answer the next 3 questions.

Two Sets

$$A = \{\text{prime numbers less than 20}\} = \{2, 3, 5, 7, 11, 13, 17, 19\}$$
$$B = \{\text{factors of 20}\} = \{1, 2, 4, 5, 10, 20\}$$

9) The union of sets A and B is

- A. $\{2, 5\}$
- B. $\{2, 4, 5, 10\}$
- C. $\{1, 2, 3, 4, 5, 7, 10, 11, 13, 17, 19, 20\}$
- D. $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$

10) The set $C = A \cap B$ is

- A. $\{2, 5\}$
- B. $\{2, 4, 5, 10\}$
- C. $\{1, 2, 3, 4, 5, 7, 10, 11, 13, 17, 19, 20\}$
- D. $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$

11) "For sets A & B , $n(A \cup B) = n(A) + n(B)$ " This statement is:

- A. True
- B. False

because there are elements in the intersection

$$n(A \cup B) = n(A) + n(B) - \text{intersection}$$

12) Which of the following rows includes two groups that would be an example of disjoint sets?

no elements in common

Row	Group 1	Group 2
A.	People who regularly drink coffee	People who regularly drink tea
B.	People who have a home phone line	People who have a cellular phone line
C.	The set of all prime numbers	The set of all even numbers
D.	The set of all multiples of 5	The set of all factors of 24

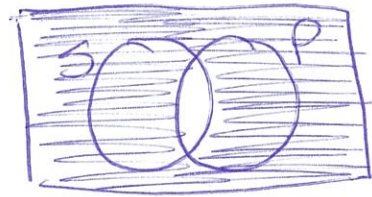
could do/have both
2

Use this information to answer the next 3 questions.

Vehicles with a sunroof are represented by $\{S\}$ and vehicles with a hands-free phone system are represented by $\{P\}$.

13) Which of the following illustrates $(S \cap P)'$?

- A. A sunroof or a hands-free phone system
- B. A sunroof and not a hands-free phone system
- C.** Not a sunroof or not a hands-free phone system
- D. Not a sunroof and not a hands-free phone system



14) Which of the following represents the vehicles which have no sunroof but do have a hands-free phone system?

- A. P
- B. S'
- C.** $S' \cap P$
- D. $S' \cup P$

Use this information to answer the next 3 questions.

Three Sets

$$R = \{\text{natural numbers less than } 50\}$$

$$S = \{\text{even numbers}\}$$

$$T = \{10, 20, 30, 40\}$$

15) Which of the following statements is true for sets R , S , and T ?

- A. $R \subset S$ F
- B. $R \subset T$ F
- C. $S \subset R$ F, S not < 50
- D. $T \subset R$ T

16) Which of the following statements is not true for sets R , S , and T ?

- A. $T \subset (R \cap S)$ T false
- B. $T \subset (R \cap T)$ T, T, T
- C. $(R \cap S) \subset T$ F
- D. $(R \cap T) \subset T$ T, T, T

Numerical Response

4.

Give $n(R) =$ 49.

$$R = \{1, 2, 3, \dots, 47, 48, 49\}$$

17) Which of the following phrases describes an empty set?

- ~~A.~~ Common factors of 3 and 7 1
- ~~B.~~ Prime numbers that are even 2
- ~~C.~~ Multiples of 5 that are less than 10 5
- D. Perfect squares less than 20 that are divisible by 5

Numeric Response – Answer Sheet

Begin each answer on the left. Leave empty boxes on the right. Decimal points get their own box. Decimal points may not go in the first box.

1.

5	0		
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2.

5	3		
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3.

4			
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4.

4	9		
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Written Response

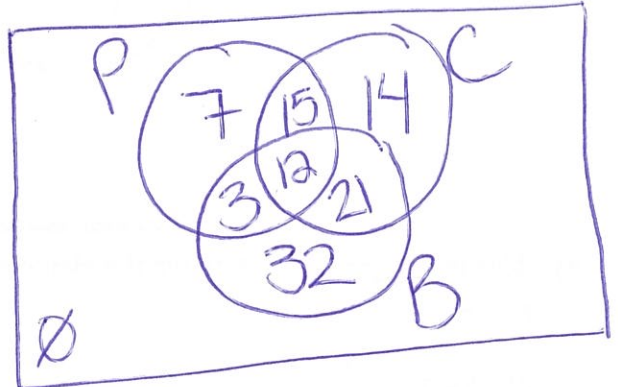
Complete each part of all questions. Show or explain all work.

1) Grade 12 students at a high school were required to take at least one of physics, chemistry or biology.

- 37 took physics
- 62 took chemistry
- 68 took biology
- 27 took physics and chemistry
- 15 took physics and biology
- 33 took chemistry and biology
- 12 students took all three sciences

How many students were in grade 12 that year?

104



Use this information to answer the next question.

A student suggests that for any set A , $A \cup \emptyset = A$ and $A \cap \emptyset = A$.

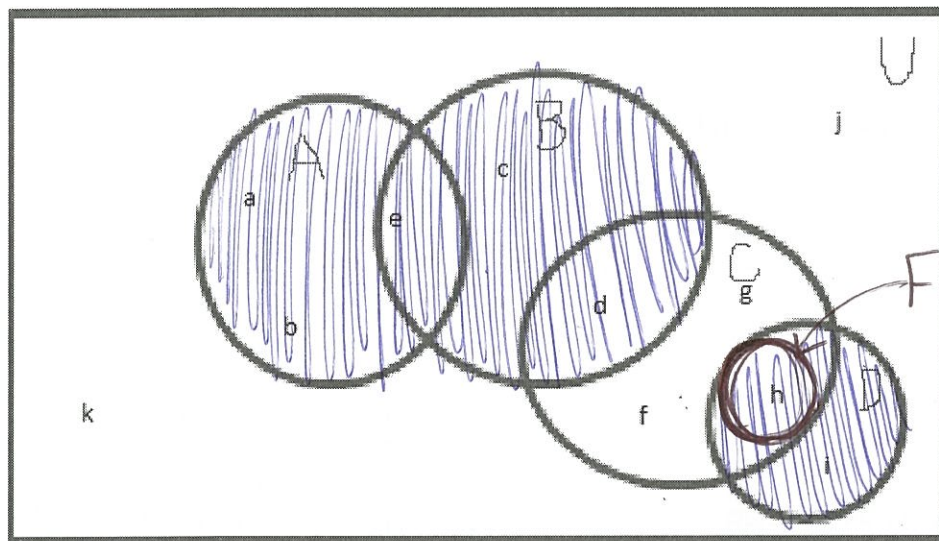
2) Is the student correct or incorrect? Use an example or a visual representation in your explanation.

- $A \cup \emptyset = A$ is correct (all of A plus nothing is A)
- $A \cap \emptyset = A$ is incorrect (the elements A has in common with the empty set is none)

3) On an exam, one student wrote $\emptyset = \{0\}$. Is the student correct? Explain your reasoning.

- Incorrect, because \emptyset , the empty set, is the set with nothing in it, $\{0\}$ is a set with the # 0 in it. $\emptyset = \{\}$ is correct.

Use this information to answer the next 2 questions. Sets are labelled with capital letters, while elements are lower case letters.



4) Use the diagram above to list the elements of each set.

- a) $A = \{a, b, e\}$
- b) $A \cup C = \{a, b, e, d, g, f, h\}$
- c) $D \cap C' = \{i\}$
- d) $(B \cap A) \cup D = \{e, h, i\}$
- e) $(B \cup C)' \cap D' = \{a, b, j, k\}$
- f) $(A \cap B) \cap C = \{e\}$

5) List two sets from the diagram that are disjoint. A and C A and D
B and D

6) Shade in $D \cup (A \cup B)$ on the diagram.

7) There is another set F. We know that $F \subset C$ and $F \subset D$. Draw and label a circle on the diagram to represent set F.

$F \subset C \cap D$

