

Math 200 - Test 2

March 16, 2011

Name key

Score _____

Show all work to receive full credit. Supply explanations where necessary.

1. (1 point) Which one of these is the greatest 3-digit base-seven number?

(a) 100_{seven}

(b) 666_{seven}

(c) 999_{seven}

(d) 777_{seven}

2. (1 point) Given that $n(A \cap B) = 5$ and $n(A \cup B) = 9$, only one of these could possibly be true. Which is it?

(a) $n(A) = 4$ ← A ALREADY HAS 5 ELEMENTS

(b) $n(B) = 9$

(c) $n(B) = 3$ ← B ALREADY HAS 5 ELEMENTS

(d) $n(A) = 14$ ← A CANNOT HAVE MORE ELEMENTS THAN $A \cup B$

3. (1 point) Which one of these illustrates the associative property of addition?

(a) $(x + 7) + 3 = 3 + (x + 7)$

(b) $5(x + 2) = 5x + 10$

(c) $(3x + 8) + (2 + y) = (y + 2) + (3x + 8)$

(d) $5 + (b + 3) = (5 + b) + 3$

4. (1 point) Choose the subtraction model that best fits the following problem situation:
The first row of the parking lot contains 9 cars, and the second row contains 5 cars. How many more cars are in the first row?

(a) comparison model

(b) take-away model

(c) set partition model

(d) missing addend model

5. (1 point) What is the **value** of the digit 5 in the numeral 4534_{six} ?

(a) 36

(b) 5

(c) 180

(d) 500

$$\begin{aligned} 5 \times 6^2 &= 5 \times 36 \\ &= 180 \end{aligned}$$

6. (2 points) Is the following set closed under addition? Explain.

$$\{1, 2, 3, \dots, 20\}$$

No, 10 & 15 ARE BOTH NUMBERS
IN THE SET, BUT

$$10 + 15 = 25 \text{ AND } 25 \text{ IS } \underline{\underline{\text{NOT}}}$$

IN THE SET.

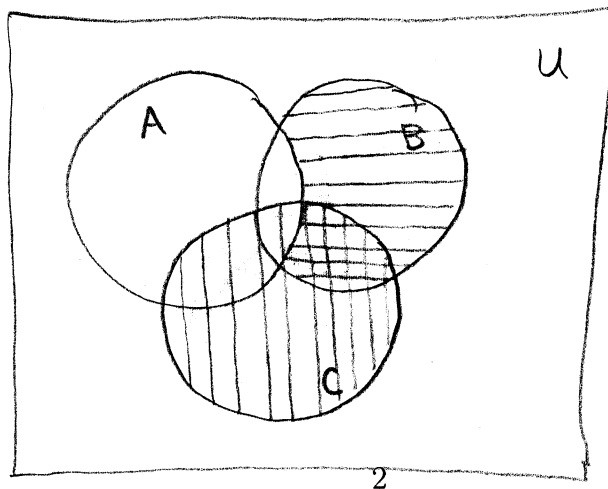
7. (2 points) List the three base-eight numbers that follow immediately after 76_{eight} .

$77_{\text{EIGHT}}, 100_{\text{EIGHT}}, 101_{\text{EIGHT}}$

8. (3 points) Convert 11011_{two} to base ten.

$$\begin{aligned} & 1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 \\ & = 16 + 8 + 0 + 2 + 1 = \boxed{27} \end{aligned}$$

9. (2 points) Shade the region of a three-set Venn diagram corresponding to $(\bar{A} \cap B) \cup C$.



$\bar{A} \cap B$ IS SHADED
HORIZONTALLY

C IS SHADED
VERTICALLY

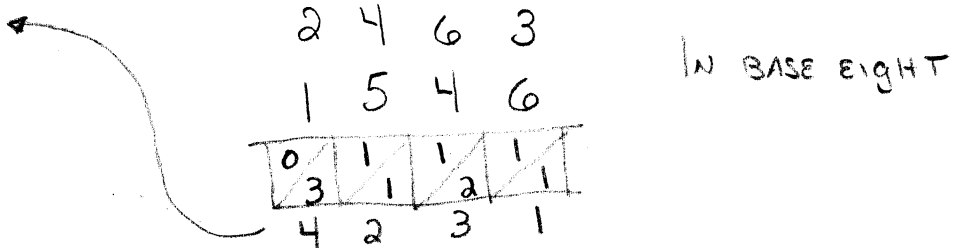
THE UNION IS THE
ENTIRE SHADED
REGION.

10. (1 point) Choose the addition model that best fits the following problem situation:
Marie has two pieces of yarn. The first is 6 in long and the second is 7 in long. If she connects them, how long is the new piece of yarn?

- (a) set partition model
- (b) combination model
- (c) set model
- (d) number line model

11. (2 points) Use any algorithm to compute the following sum: $2463_{\text{eight}} + 1546_{\text{eight}}$

- (a) 4231_{eight}
- (b) 4009_{eight}
- (c) 4301_{eight}
- (d) 2057_{eight}



12. (1 point) Let U be the set of all PSC students. Let T be the set of students who drink tea and C be the set of all students who drink coffee. Which one of the following is a description of an element of $\overline{C} - T$?

- (a) a student who drinks coffee but not tea
- (b) a student who neither drinks coffee nor tea
- (c) a student who drinks tea but not coffee
- (d) a student who drinks both coffee and tea

13. (1 point) Choose the multiplication model that best fits the following problem situation:
The desks in the room are arranged in 6 rows with 5 desks in each row. How many desks are there in all?

- (a) Cartesian product model
- (b) set partition model
- (c) area/array model
- (d) repeated addition model

14. (1 point) Let $A = \{x, y, z, \pi, \phi\}$ and $B = \{3, 8, y, \phi\}$. Which one of the following represents $n(B - A)$?

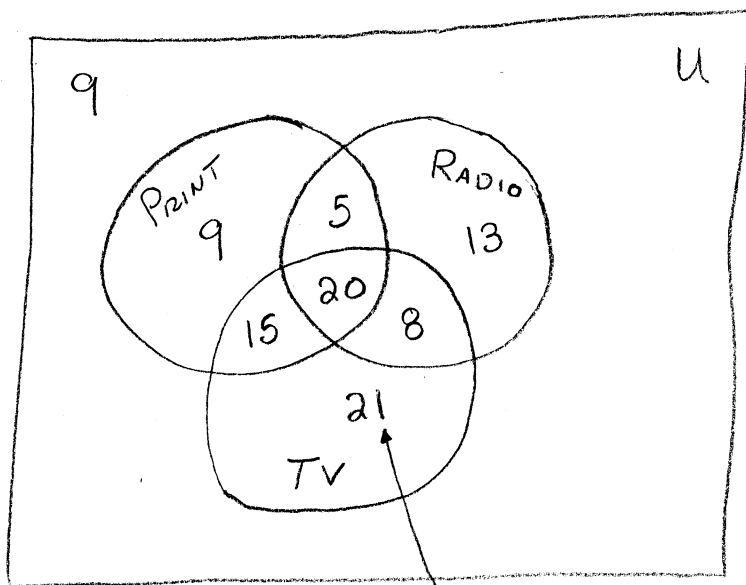
- (a) 2
- (b) 4
- (c) 11
- (d) -2

$$B - A = \{3, 8\}$$

15. (5 points) 100 people were asked how they obtain their daily news. Here are their responses:

- 49 get their news from printed sources
- 46 get their news from the radio
- 25 get their news from the radio and printed sources
- 28 get their news from the radio and TV
- 35 get their news from TV and printed sources
- 20 get their news from all three sources
- 9 get their news from none of these sources

(a) Use a three-set Venn diagram to organize this information.



$$100 - (15 + 20 + 8 + 13 + 5 + 9 + 9) = 100 - 79 = 21$$

(b) How many people get their news from TV?

$$15 + 20 + 8 + 21 = \boxed{64}$$

(c) How many people get their news from exactly one of these sources?

$$9 + 13 + 21 = \boxed{43}$$

(d) How many people get their news from exactly two of these sources?

$$15 + 5 + 8 = \boxed{28}$$

16. (3 points) Convert 210 to base three.

$$3^0 = 1, 3^1 = 3, 3^2 = 9, 3^3 = 27, 3^4 = 81,$$

$$3^5 = 243$$

$$\begin{array}{r} 3^4 = 81 \overline{) 210} \quad 2 \\ \underline{-162} \\ 3^3 = 27 \overline{) 48} \quad 1 \\ \underline{-27} \\ 3^2 = 9 \overline{) 21} \quad 2 \\ \underline{-18} \\ 3^1 = 3 \overline{) 3} \quad 1 \\ \underline{-3} \\ 3^0 = 1 \overline{) 0} \quad 0 \end{array}$$

$$210 = 21210_{\text{THREE}}$$

17. (4 points) Think about the strategies that we studied for mastering basic addition facts. Of those strategies, use a different one to compute each sum below. Show work or explain your reasoning.

(a) $5 + 4$

Doubles ...

$$5 + 4 = 1 + 4 + 4 = 1 + 8 = 9$$

(b) $9 + 8$

MAKING 10...

$$9 + 8 = 9 + 1 + 7 = 10 + 7 = 17$$

18. (3 points) Use any of the algorithms we discussed in class, except the standard algorithm, to compute $416 - 168$.

$$\begin{array}{r} 416 \\ - 168 \\ \hline \end{array} + 2 \rightarrow \begin{array}{r} 418 \\ - 170 \\ \hline \end{array} + 30 \rightarrow \begin{array}{r} 448 \\ - 200 \\ \hline \end{array}$$

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EQUAL ADDITIONS
ALGORITHM

19. (3 points) Use any of the algorithms we discussed in class, except the standard algorithm, to compute $5419 + 1397$.

LATTICE ADDITION

$$\begin{array}{r}
 5419 \\
 + 1397 \\
 \hline
 \begin{array}{|c|c|c|c|}
 \hline
 0 & 0 & 1 & 1 \\
 \hline
 6 & 7 & 0 & 6 \\
 \hline
 \end{array} \\
 \hline
 6816
 \end{array}$$

Sum is
6816.

20. (3 points) Let $A = \{x, y\}$ and $B = \{2, 4\}$.

(a) Determine $A \times B$.

$$\{ (x, 2), (x, 4), (y, 2), (y, 4) \}$$

(b) Is it true that $A \times B = B \times A$? Explain.

No. ORDER IS IMPORTANT IN "ORDERED" PAIRS
 $(x, 2) \neq (2, x)$

(c) Determine $B \times \emptyset$.

\emptyset

21. (2 points) Rewrite each expression using the indicated property, and only that property, exactly one time.

(a) Commutative property of addition:

$$x + 8(3 + 1)$$

$$8(3 + 1) + x$$

$$\text{OR } x + 8(1 + 3)$$

(b) Associative property of addition:

$$(2y + 4) + 6 + (3 + 8x)$$

$$2y + (4 + 6) + (3 + 8x)$$

6

OR

$$(2y + 4) + (6 + 3) + 8x$$

22. (1 point) State the closure property of whole number addition.

THE SUM OF ANY TWO WHOLE NUMBERS
IS ALSO A WHOLE NUMBER.

23. (3 points) Write a word problem involving multiplication in which the multiplication fact is best described by the Cartesian product model.

JOHN HAS 5 SHIRTS AND 6 TIES. HOW MANY
SHIRT-TIE COMBINATIONS DOES HE HAVE ?

24. (2 points) Use the missing addend model to describe how to compute $8 - 3$.

$$8 - 3 = \square \iff 8 = 3 + \square$$

WHAT PLUS 3 IS 8 ?

25. (1 point) Explain why 20112_{two} cannot be a correctly written base-two numeral.

↑
2 IS NOT A DIGIT IN THE
BASE-TWO SYSTEM.