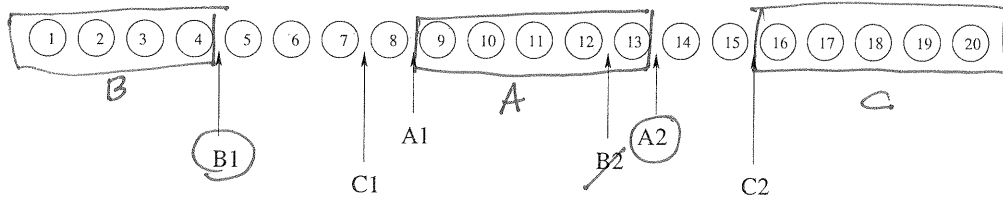


EXAM 4– Version A

Multiple Choice. (21 questions at 5 points each) Circle the letter of the best answer.

For problems on this page: Three students, Ali, Bobby, and Carrie, divide fairly 20 pieces of candy, of different types, using the Method of Markers. The candy is placed in an array and the players bid by placing markers as shown below. (Marker A_1 is Ali's first marker, A_2 is her second; B_1 and B_2 are Bobby's markers, and C_1 and C_2 are Carrie's.) It is agreed that candy leftover after the allocation will be kept by the teacher. Recall that our convention is to go from left to right.



- B** 1. Who gets candy number 4?
- (a) Ali
 - (b) Bobby
 - (c) Carrie
 - (d) it is left over
 - (e) none of these

- D** 4. Who gets candy number 15?
- (a) Ali
 - (b) Bobby
 - (c) Carrie
 - (d) it is left over
 - (e) none of these

- D** 2. Who gets candy number 8?
- (a) Ali
 - (b) Bobby
 - (c) Carrie
 - (d) it is left over
 - (e) none of these

- C** 5. Who gets candy number 20?
- (a) Ali
 - (b) Bobby
 - (c) Carrie
 - (d) it is left over
 - (e) none of these

- A** 3. Who gets candy number 13?
- (a) Ali
 - (b) Bobby
 - (c) Carrie
 - (d) it is left over
 - (e) none of these

For problems on this page: Santa's reindeer agree to divide a \$24 pizza fairly using the Lone Divider Method. The table shows how each player values each of the eight slices that have been cut by the divider. Assume that all of Santa's reindeer play honestly.

Fair share:

$$\frac{24}{8} = \$3$$

| | s_1 | s_2 | s_3 | s_4 | s_5 | s_6 | s_7 | s_8 |
|---------|-----------------|----------------|-----------------|----------------|----------------|-----------------|----------------|----------------|
| Dasher | \$5 | \$2 | \$4 | \$2 | \$2 | \$5 | \$2 | \$2 |
| Dancer | \$1 | \$2 | \$1 | \$1 | \$1 | \$16 | \$1 | \$1 |
| Prancer | \$2 | \$2 | \$10 | \$1 | \$3 | \$2 | \$2 | \$2 |
| Vixen | \$10 | \$2 | \$2 | \$2 | \$2 | \$2 | \$2 | \$2 |
| Comet | \$6 | \$2 | \$2 | \$1 | \$2 | \$6 | \$3 | \$2 |
| Cupid | \$11 | \$1 | \$0 | \$2 | \$0 | \$2 | \$2 | \$6 |
| Donder | \$3 | \$3 | \$3 | \$3 | \$3 | \$3 | \$3 | \$3 |
| Blitzen | \$4 | \$4 | \$4 | \$2 | \$4 | \$1 | \$1 | \$4 |

6. Which reindeer was the divider?

B

- (a) Vixen
 (b) Donder
 (c) Blitzen
 (d) It is impossible to tell from the information given
 (e) none of these

7. What is Dasher's bid list (declaration)?

A

- (a) s_1, s_3, s_6
 (b) s_1, s_6
 (c) $s_1, s_2, s_3, s_4, s_5, s_6, s_7, s_8$
 (d) s_1
 (e) none of these

8. Find a fair division of the pizza using these slices, if possible. Which piece does Blitzen receive?

B

- (a) s_5
 (b) s_2
 (c) Any one of $s_1, s_2, s_3, s_5,$ or s_8
 (d) No fair division is possible using these slices.
 (e) none of these

9. Find a fair division of the pizza using these slices, if possible. Which piece does Cupid receive?

B

- (a) s_1
 (b) s_8
 (c) Any one of s_1 or s_8
 (d) No fair division is possible using these slices.
 (e) none of these

Version A

For problems on this page: Four heirs (A, B, C, and D) must fairly divide an estate consisting of two items, a house and a cabin, using the Method of Sealed Bids. The players' bids, in dollars, are shown below.

| | A | B | C | D |
|-------|---------|---------|---------|---------|
| House | 195,000 | 212,000 | 201,000 | 182,000 |
| Cabin | 45,000 | 36,000 | 35,000 | 42,000 |

10. How much is the original fair share of player A worth?

- (a) \$240,000
 (b) \$80,000
 (c) \$120,000
 (d) \$60,000
 (e) none of these

D

$$A: \frac{240,000}{4} = \$60,000$$

$$\text{receives } 60,000 - 45,000 = \$15,000$$

11. In the initial allocation, what did player B receive?

- (a) Player B gets \$62,000 from the estate.
 (b) Player B gets the house and the cabin and pays the estate \$186,000.
 (c) Player B gets the house and pays the estate \$274,000.
 (d) Player B gets the house and pays the estate \$150,000.
 (e) none of these

D

$$B: \frac{248,000}{4} = \$62,000$$

$$\text{pays estate } 212,000 - 62,000 = 150,000$$

12. After the initial allocation to each player is made, how much is the surplus?

- (a) \$32,000
 (b) \$0
 (c) \$20,000
 (d) \$150,000
 (e) none of these

C

$$C: \frac{236,000}{4} = \$59,000$$

$$D: \frac{224,000}{4} = \$56,000$$

$$\text{Surplus: } 150,000 - (15,000 + 59,000 + 56,000) = \$20,000$$

$$\text{each player's share: } \$5,000$$

13. After all is said and done, what is the final allocation to Player A?

- (a) the cabin plus \$5,000 in cash
 (b) the cabin plus \$10,000 in cash
 (c) the cabin plus \$20,000 in cash
 (d) \$65,000 in cash only
 (e) none of these

C

cabin and

$$15,000 + 5,000 = \$20,000$$

For problems on this page: Jorge buys a round half-chocolate/half-strawberry cake for \$30. He values chocolate cake four times as much as he values strawberry cake. Round answers to the nearest penny.

14. What is the value, to Jorge, of the strawberry half of the cake?

- (a) \$15.00
 (b) \$7.50
 C (c) \$6.00
 (d) \$24.00
 (e) none of these

Let x be the value of the strawberry half to Jorge.
 Then $4x$ is the value of the chocolate half to Jorge.
 Total value of cake: $x + 4x = 30$
 $5x = 30$
 $x = \$6.00$

15. What is the value, to Jorge, of the chocolate half of the cake?

- (a) \$15.00
 (b) \$22.50
 D (c) \$6.00
 (d) \$24.00
 (e) none of these

$$4x = 4(6) = \$24.00$$

$$\text{Check: } 6.00 + 24.00 = 30.00 \quad \checkmark$$

16. What is the value, to Jorge, of a 60° slice of strawberry cake?

- (a) \$3.60
 (b) \$4.50
 C (c) \$2.00
 (d) \$1.00
 (e) none of these

$$\frac{60^\circ}{180^\circ} = \frac{1}{3}$$

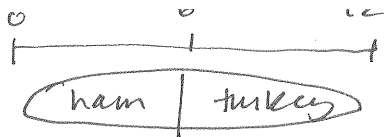
$$\frac{1}{3} (6.00) = \$2.00$$

17. What is the value, to Jorge, of a 45° slice of chocolate cake?

- A (a) \$6.00
 (b) \$10.80
 (c) \$12.00
 (d) \$3.00
 (e) none of these

$$\frac{45^\circ}{180^\circ} = \frac{1}{4}$$

$$\frac{1}{4} (24.00) = \$6.00$$



For problems on this page: Brenda and Eddy buy a 12-inch half-ham, half-turkey sub sandwich for \$4.80. (So there are 6 inches of ham and 6 inches of turkey.) Eddy values ham three times as much as turkey.

18. What is the value, to Eddy, of 1 inch of turkey? *Let x be the value of 1 in of turkey to Eddy.*

- (a) \$0.60
- (b) \$0.30
- (c) \$0.20
- (d) \$0.90
- (e) none of these

Then $3x$ is the value of 1 in of ham to Eddy.

Total value:

$$6x + 6(3x) = 4.80$$

$$6x + 18x = 4.80$$

$$24x = 4.80$$

$$x = \frac{4.80}{24} = \$0.20$$

19. What is the value, to Eddy, of 1 inch of ham? *$3x = 3(0.20) = \$0.60$*

- (a) \$0.60
- (b) \$0.30
- (c) \$0.20
- (d) \$0.90
- (e) none of these

A fair share is $\frac{4.80}{2} = \$2.40$

A fair share of ham is

$$\frac{\$2.40}{\$0.60/\text{in}} = 4 \text{ inches of ham}$$

20. Suppose Eddy is the Divider in a 2-person Divider-Chooser Fair Division Game. He cuts the sub into two pieces crosswise. The two pieces are as follows.

- (a) One piece consists of 6 inches of ham and the other piece consists of 6 inches of turkey.
- (b) One piece consists of 4 inches of ham and the other piece consists of 2 inches of ham and 6 inches of turkey.
- (c) One piece consists of 3 inches of ham and the other piece consists of 3 inches of ham and 6 inches of turkey.
- (d) One piece consists of 4 inches of turkey and the other piece consists of 2 inches of turkey and 6 inches of ham.
- (e) none of these

21. Now suppose Eddy is the Chooser in a 2-person Divider-Chooser Fair Division Game. The Divider, Brenda, has cut the sandwich into two pieces. One piece consists of 6 inches of ham and the other piece consists of 6 inches of turkey. Which piece does Eddy choose?

- (a) Eddy chooses 6 inches of ham.
- (b) Eddy chooses 6 inches of turkey.
- (c) none of these

