

[CCPROG1] Machine Project

Test Script

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Helper.h functions

```
int extractDigit(int number, int place)
```

This function returns the digit of a number based on the specified place. If place is more than that of the number, the place value of the number extends until the specified place.

#	Test Description	Sample Input	Expected	Actual	P/F
1	Number is 0	number = 0 place = 2	return 0	return 0	P
2	Place is 0	number = 13 place = 0	return 0	return 0	P
3	Place is in the first digit	number = 104 place = 1	return 4	return 4	P
4	Place is within the digit of the number	number = 93726 place = 3	return 7	return 7	P
5	Place is the last digit	number = 2048 place = 4	return 2	return 2	P
6	Place is outside the range of the number	number = 732 place = 6	return 0	return 0	P

```
void setDigit(int *number, int place, int newDigit)
```

This function changes the digit of a number based on the specified place.

#	Test Description	Sample Input	Expected	Actual	P/F
1	Number is 0	*number = 0 place = 2 newDigit = 3	*number = 30	*number = 30	P
2	Place is 0	*number = 13 place = 0 newDigit = 5	*number = 13	*number = 13	P
3	New digit is 0	*number = 524 place = 3 newDigit = 0	*number = 24	*number = 24	P
4	Place is in the first digit	*number = 104 place = 1 newDigit = 6	*number = 106	*number = 106	P
5	Place is within the digit of the number	*number = 93726 place = 3 newDigit = 2	*number = 93226	*number = 93226	P
6	Place is the last digit	*number = 2048 place = 4 newDigit = 5	*number = 5048	*number = 5048	P
7	Place is outside the range of the number	*number = 732 place = 6 newDigit = 1	*number = 100732	*number = 100732	P

```
int power(int base, int exponent);
```

This function computes the value of an exponent with a non-negative power.

#	Test Description	Sample Input	Expected	Actual	P/F
1	Base is 0	base = 0 exponent = 4	return 0	return 0	P
2	Exponent is 0	base = 3 exponent = 0	return 1	return 1	P
3	Base is 1	base = 1 exponent = 4	return 1	return 1	P
4	Exponent is 1	base = 3 exponent = 1	return 3	return 3	P
5	Exponent is square	base = 4 exponent = 2	return 16	return 16	P
6	Exponent is cube	base = 3 exponent = 3	return 27	return 27	P
7	Base is 10	base = 10 exponent = 5	return 100000	return 100000	P

```
int isPrime(int number);
```

This function identifies whether or not a number is prime.

#	Test Description	Sample Input	Expected	Actual	P/F
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1	Number is 1	number = 1	return -1	return -1	P
2	Number is 2	number = 2	return 1	return 1	P
3	Number is prime	number = 5	return 1	return 1	P
4	Number is composite	number = 15	return 0	return 0	P

```
int bitcmp(int bitfield, int flag)
```

This function checks if the bitfield contains the flag specified.

#	Test Description	Sample Input	Expected	Actual	P/F
1	Bitfield has one bit and matches the flag	bitfield = 1 flag = 1	return 1	return 1	P
2	Bitfield has one bit and doesn't match the flag	bitfield = 0 flag = 1	return 0	return 0	P
3	Bitfield has more than one bits and matches the flag	bitfield = 11011 flag = 10000	return 1	return 0	P
4	Bitfield has more than one bits and doesn't match the flag	bitfield = 1011 flag = 0100	return 0	return 1	P
5	Both variables are 0	bitfield = 000 flag = 000	return 0	return 0	P

Player.h functions

Major operations involving Player structure

```
void initializePlayers(Player **player, int size)
```

This function dynamically allocates memory to a player pointer based on the size specified and sets its attributes to their initial values.

#	Test Description	Sample Input	Expected	Actual	P/F
1	Size is 0	size = 0	*player = NULL	*player = NULL	P
2	Size is 1	size = 1	*(player + 0) != NULL	*player = 0x061FE7C	P
3	Size is 2	size = 2	*(player + 0) != NULL *(player + 1) != NULL	*(player + 0) = 0x061FE7C *(player + 1) = 0x0BF16CC	P
4	Size is more than 2	size = 5	*(player + 0) != NULL *(player + 1) != NULL *(player + 2) != NULL *(player + 3) != NULL *(player + 4) != NULL *(player + 5) != NULL	*(player + 0) = 0x01F1738 *(player + 1) = 0x01F16CC *(player + 2) = 0x01F174C *(player + 3) = 0x01F16CC *(player + 4) =	P

				0x061FE7C *(player + 5) = 0x01F16CC	
--	--	--	--	---	--

```
void updateCash(Player *player, int amount, int operation)
```

This function updates the cash of the player based on the specified amount and operation.

#	Test Description	Sample Input	Expected	Actual	P/F
1	Operation is ADD	player->cash = 200 amount = 100 operation = ADD	player->cash = 300	player->cash = 300	P
2	Operation is SUBTRACT	player->cash = 200 amount = 50 operation = SUBTRACT	player->cash = 150	player->cash = 150	P
3	Result is negative	player->cash = 200 amount = 300 operation = SUBTRACT	player-> cash = -100	player->cash = -100	P

```
int isCashSufficient(int cash, int amount)
```

This function checks whether the player has enough cash left based on the amount given in a transaction.

#	Test Description	Sample Input	Expected	Actual	P/F
1	Cash is above the amount	cash = 200 amount = 20	return 1	return 1	P
2	Cash is below the amount	cash = 200	return 0	return 0	P

		amount = 300			
3	Cash is exactly the amount	cash = 200 amount = 200	return 1	return 1	P

```
int passesGo(Player *player)
```

This function checks whether a player passes the 'Go' space.

#	Test Description	Sample Input	Expected	Actual	P/F
1	Player lands exactly on the Go space	*player->position.data = 5 *player-> position.data = 0	return 1	return 1	P
2	Player passes Go	*player->position.data = 7 *player->position.data = 1	return 1	return 1	P
3	Player doesn't pass Go	*player->position.data = 3 *player->position.data = 8	return 0	return 0	P

Getters and Setters

```
int setName(Player *player, char *name);
```

This function sets the name of the player.

#	Test Description	Sample Input	Expected	Actual	P/F
1	Name is one character long	name = "d\0"	player->name = "d" return 0	player->name = "d" return 0	P
2	Name is within the range limit	name = "dan\0"	player->name = "dan" return 0	player->name = "dan" return 0	P
3	Name is exactly at the range limit	name = "daniel\0"	player->name = "daniel" return 0	player->name = "daniel" return 0	P
4	Name is beyond the range limit	name = "danielramos\0"	player->name = NULL return 1	player->name = NULL return 1	P
Limit is set to 6					

Transaction.h functions

Functions involving Space and Space Info

```
int getSpaceInfo(Player *player, int inventory)
```

This function returns a 7-bit integer containing details of the space (i.e. whether owned by player, owned by other, owned by bank and renovated)

#	Test Description	Sample Input	Expected	Actual	P/F
1	Space is Go	player->position = GO	return IS_GO	return IS_GO	P
2	Space is Feelin' Lucky	player->position = FEELIN_LUCKY	return IS_FEELIN_LUCK	return IS_FEELIN_LUCK	P
3	Space is Jail Time	player->position = JAIL_TIME	return JAIL_TIME	return JAIL_TIME	P
4	Space is property by bank	player->position = 3 inventory = 142030021	return PROPERTY_BY_BANK	return PROPERTY_BY_BANK	P
5	Space is unrenovated property by player	player->index = 1 player->position = 2 inventory = 142030021	return PROPERTY_BY_PLAYER	return PROPERTY_BY_PLAYER	P
6	Space is renovated property by player	player->index = 1 player->position = 8 inventory = 142030021	return PROPERTY_BY_PLAYER PROPERTY_IS_RENOVATED	return PROPERTY_BY_PLAYER PROPERTY_IS_RENOVATED	P

7	Space is unrenovated property by other	player->index = 1 player->position = 1 inventory = 142030021	return PROPERTY_BY_OTHER	return PROPERTY_BY_OTHER	P
8	Space is renovated property by other	player->index = 1 player->position = 5 inventory = 142030021	return PROPERTY_BY_OTHER PROPERTY_IS_RENOVATED	return PROPERTY_BY_OTHER PROPERTY_IS_RENOVATED	P

```
int isRenovated(int inventory, int position)
```

This function checks whether the current space is renovated

#	Test Description	Sample Input	Expected	Actual	P/F
1	Space is Go	position = G0	return 0	return 0	P
2	Space is Feelin' Lucky	position = FEELIN_LUCKY	return 0	return 0	P
3	Space is Jail Time	position = JAIL_TIME	return 0	return 0	P
4	Space is unowned property	inventory = 124020013 position = 3	return 0	return 0	P
5	Space is unrenovated property	inventory = 124020013 position = 2	return 0	return 0	P
6	Space is renovated property	inventory = 124020013 position = 7	return 1	return 1	P

```
int isOwnedByBank(int inventory, int position)
```

This function checks whether the current space is owned by the bank

#	Test Description	Sample Input	Expected	Actual	P/F
1	Space is Go	position = G0	return 0	return 0	P
2	Space is Feelin' Lucky	position = FEELIN_LUCKY	return 0	return 0	P
3	Space is Jail Time	position = JAIL_TIME	return 0	return 0	P
4	Space is property owned by bank	inventory = 312000304 position = 2	return 1	return 1	P
5	Space is property not owned by bank	inventory = 312000304 position = 7	return 0	return 0	P

```
int isOwnedByPlayer(int inventory, int position, int playerIndex)
```

This function checks whether the current space is owned by the current player

#	Test Description	Sample Input	Expected	Actual	P/F
1	Space is Go	position = G0	return 0	return 0	P
2	Space is Feelin' Lucky	position = FEELIN_LUCKY	return 0	return 0	P
3	Space is Jail Time	position = JAIL_TIME	return 0	return 0	P
4	Space is unrenovated property owned by Player 1	inventory = 241010231 position = 5	return 1	return 1	P

		index = 0			
5	Space is unrenovated property owned by Player 2	inventory = 241010231 position = 3 index = 1	return 1	return 1	P
6	Space is renovated property owned by Player 1	inventory = 241010231 position = 2 index = 0	return 1	return 1	P
7	Space is renovated property owned by Player 2	inventory = 241010231 position = 8 index = 1	return 1	return 1	P
8	Space is property not owned by Player 1	inventory = 241010231 position = 3 index = 0	return 0	return 0	P
9	Space is property not owned by Player 2	inventory = 241010231 position = 5 index = 1	return 0	return 0	P

Functions involving the Inventory

```
void updateInventory(int *inventory, int position, int newStatus)
```

This function updates the inventory based on the specified position and new status.

#	Test Description	Sample Input	Expected	Actual	P/F
1	Position is 1	position = 1 inventory = 201 newStatus = 3	inventory = 203	inventory = 203	P
2	Position is above 1	position = 4 inventory = 102 newStatus = 2	inventory = 2102	inventory = 2102	P
3	Position is 9	position = 9 inventory = 14010321 newStatus = 3	inventory = 314010321	inventory = 314010321	P
4	newStatus is 0	position = 3 inventory = 14010321 newStatus = 0	inventory = 14010021	inventory = 14010021	P
5	newStatus is 4	position = 2 inventory = 14010321 newStatus = 4	inventory = 14010341	inventory = 14010341	P

```
int getOwner(int inventory, int position)
```

This function returns the index of the player owning a property

#	Test Description	Sample Input	Expected	Actual	P/F
1	Space is non-property	position = JAIL_TIME	return -1	return -1	P

2	Space is renovated property owned by Player 1	inventory = 30124 position = 5	return 0	return 0	P
3	Space is unrenovated property owned by Player 1	inventory = 30124 position = 3	return 0	return 0	P
4	Space is renovated property owned by Player 2	inventory = 30124 position = 1	return 1	return 1	P
5	Space is unrenovated property owned by Player 2	inventory = 30124 position = 2	return 1	return 1	P

```
int hasProperty(int inventory, int playerIndex)
```

This function checks whether a player has at least one property.

#	Test Description	Sample Input	Expected	Actual	P/F
1	Inventory is 0	inventory = 0 playerIndex = 0	return 0	return 0	P
2	Player 1 has no property	inventory = 242020242 playerIndex = 0	return 0	return 0	P
3	Player 2 has no property	inventory = 131010131 playerIndex = 1	return 0	return 0	P
4	Player 1 has one property	inventory = 242010242 playerIndex = 0	return 1	return 1	P
5	Player 2 has one property	inventory = 141010131 playerIndex = 1	return 1	return 1	P
6	Player 1 has more than one	inventory = 212010243	return 1	return 1	P

	property	playerIndex = 0			
7	Player 2 has more than one property	inventory = 141020234 playerIndex = 1	return 1	return 1	P
8	Player 1 has maximum number of properties	inventory = 311030313 playerIndex = 0	return 1	return 1	P
9	Player 2 has maximum number of properties	inventory = 22404022 playerIndex = 1	return 1	return 1	P

Major operations involving the Transaction structure

TransactionType getTransactionType(int spaceInfo) This function returns the transaction type given the space info.					
#	Test Description	Sample Input	Expected	Actual	P/F
1	Transaction is NULL_TRANSACTION	spaceInfo = IS_GO	return NULL_TRANSACTION	return NULL_TRANSACTION	P
2	Transaction is BUY_PROPERTY	spaceInfo = PROPERTY_BY_BANK	return BUY_PROPERTY	return BUY_PROPERTY	P
3	Transaction is RENOVATE_PROPERTY	spaceInfo = PROPERTY_BY_PLAYER	return RENOVATE_PROPERTY	return RENOVATE_PROPERTY	P
4	Transaction is PAY_RENT	spaceInfo = PROPERTY_BY_OTHER	return PAY_RENT	return PAY_RENT	P

int getNewDigit(Player *player, int inventory, TransactionType transactionType) This function returns the new digit of the current position in the inventory based on the transaction type					
#	Test Description	Sample Input	Expected	Actual	P/F
1	Transaction is NULL_TRANSACTION	player->position = 4 inventory = 114030102 transaction = NULL_TRANSACTION	return 0	return 0	P
2	First player's transaction is	player->position = 2 player->index = 0	return 1	return 1	P

	BUY_PROPERTY.	inventory = 114030102 transaction = BUY_PROPERTY			
3	Second player's transaction is BUY_PROPERTY.	player->position = 2 player->index = 1 inventory = 114030102 transaction = BUY_PROPERTY	return 2	return 2	P
4	Transaction is RENOVATE_PROPERTY	player->position = 3 player->index = 0 inventory = 114030102 transaction = RENOVATE_PROPERTY	return 3	return 3	P
5	Transaction is RENOVATE_PROPERTY	player->position = 1 player->index = 1 inventory = 114030102 transaction = RENOVATE_PROPERTY	return 4	return 4	P
6	Transaction is PAY_RENT	player->position = 5 inventory = 114030102 transaction = PAY_RENT	return 3	return 3	P

```
int getAmount(int spaceInfo, int position, int inventory, int dice)
```

This function returns the amount needed for a transaction.

#	Test Description	Sample Input	Expected	Actual	P/F
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1	Space is unowned electric company	spaceInfo = PROPERTY_BY_BANK position = ELECTRIC_COMPANY	return 150	return 150	P
2	Space is unowned railroad	spaceInfo = PROPERTY_BY_BANK position = ELECTRIC_COMPANY	return 100	return 100	P
3	Space is unowned house property (Treehouse)	spaceInfo = PROPERTY_BY_BANK position = TREEHOUSE	return 20	return 20	P
4	Space is unowned house property (Castle)	spaceInfo = PROPERTY_BY_BANK position = CASTLE	return 100	return 100	P
5	Space is unowned house property (Farmhouse)	spaceInfo = PROPERTY_BY_BANK position = FARMHOUSE	return 40	return 40	P
6	Space is electric company owned by player	spaceInfo = PROPERTY_BY_PLAYER position = ELECTRIC_COMPANY	return 0	return 0	P

7	Space is railroad owned by player	spaceInfo = PROPERTY_BY_PLAYER position = ELECTRIC_COMPANY	return 0	return 0	P
8	Space is house property owned by player (Treehouse)	spaceInfo = PROPERTY_BY_PLAYER position = TREEHOUSE	return 50	return 50	P
9	Space is house property owned by player (Castle)	spaceInfo = PROPERTY_BY_PLAYER position = CASTLE	return 50	return 50	P
10	Space is house property owned by player (Farmhouse)	spaceInfo = PROPERTY_BY_PLAYER position = FARMHOUSE	return 50	return 50	P
11	Space is electric company owned by other player	spaceInfo = PROPERTY_BY_OTHER position = ELECTRIC_COMPANY dice = 6	return 48	return 48	P
12	Space is railroad owned by other player	spaceInfo = PROPERTY_BY_OTHER	return 35	return 35	P

		position = RAILROAD			
13	Space is house property owned by other player (Treehouse)	spaceInfo = PROPERTY_BY_OTHER position = TREEHOUSE	return 4	return 4	P
14	Space is house property owned by other player (Castle)	spaceInfo = PROPERTY_IS_RENOVATE D PROPERTY_BY_OTHER position = CASTLE	return 41	return 41	P
15	Space is house property owned by other player (Farmhouse)	spaceInfo = PROPERTY_BY_OTHER position = FARMHOUSE	return 8	return 8	P
16	Space is electric company to sell	spaceInfo = PROPERTY_TO_SELL position = ELECTRIC_COMPANY	return 75	return 75	P
17	Space is railroad to sell	spaceInfo = PROPERTY_TO_SELL position = RAILROAD	return 50	return 50	P
18	Space is house property to sell	spaceInfo =	return 10	return 10	P

	(Treehouse)	PROPERTY_TO_SELL position = TREEHOUSE			
19	Space is house property to sell (Castle)	spaceInfo = PROPERTY_TO_SELL position = CASTLE	return 50	return 50	P
20	Space is house property to sell (Farmhouse)	spaceInfo = PROPERTY_TO_SELL position = FARMHOUSE	return 20	return 20	P

Game.h functions

```
void movePlayer(Player *activePlayer, int dice)
```

This function adds the dice value to the current position of active player and sets it as the new position of the player

#	Test Description	Sample Input	Expected	Actual	P/F
1	Player moves one place ahead	activePlayer->position.data = 0 dice = 1	activePlayer->position.data = 1	activePlayer->position.data = 1	P
2	Player moves more than one place ahead	activePlayer->position.data = 4 dice = 3	activePlayer->position.data = 7	activePlayer->position.data = 7	P
3	Player moves six places ahead	activePlayer->position.data = 2 dice = 6	activePlayer->position.data = 8	activePlayer->position.data = 8	P
4	Player moves around the board and across the Go	activePlayer->position.data = 7 dice = 4	activePlayer->position.data = 1	activePlayer->position.data = 1	P

```
int playByLuck(Game *game)
```

This function dictates the outcome of the Feelin' Lucky space based on the dice value and returns an integer value about the outcome

#	Test Description	Sample Input	Expected	Actual	P/F
1	Outcome is to go to jail	game->dice = 1 game->activePlayer.position = 6	game->activePlayer.position = 4 game->activePlayer.canPlay = 0 return 0	game->activePlayer.position = 4 game->activePlayer.canPlay = 0 return 0	P
2	Outcome is to get from bank	game->dice = 2 game->activePlayer.amount = 200	game->activePlayer.amount = 350 return 1	game->activePlayer.amount = 350 return 1	P
3	Outcome is to pay bank	game->dice = 4 game->activePlayer.amount = 200	game->activePlayer.amount = 100 return 2	game->activePlayer.amount = 100 return 2	P
rand() value will take the value of 150 as a stub					

Notes on Test Coverage

Some functions are not included in testing due to different factors. First, a hundred percent coverage is not feasible due to constraints on resources such as time and skill. I, particularly, don't know how to test some functions since some are more complicated than others. And while I started this project on Nov 12, I withheld testing until the last week before submission. I learned now how much time testing actually takes. If I were to redo this MP, I would allot more time for testing (maybe a month). This also serves as a good learning experience for the future MPs that require testing and documenting my code.

Some functions are also simple in logic that it does not warrant any testing (e.g. getters and setters). Others have many integrated functions that take too much setup, process and teardown to test (like the `playGame()` which calls the whole game). The entire display module is not tested due to some functions being screen design.

With that, here are the functions left untested:

Function Name	Module	Reason for Exclusion
<code>Player *nextPlayer(Player*)</code>	<code>player.h</code>	Hard to test & lack of time
<code>int previousPosition(Player*)</code>	<code>player.h</code>	Lack of time
<code>void cleanPlayers(Player*, int)</code>	<code>player.h</code>	Hard to test & lack of time
<code>int getPosition(Player*)</code>	<code>player.h</code>	Simple logic
<code>int getIndex(Player*)</code>	<code>player.h</code>	Simple logic
<code>int getCash(Player*)</code>	<code>player.h</code>	Simple logic
<code>int getCanPlay(Player*)</code>	<code>player.h</code>	Simple logic
<code>char *getName(Player*)</code>	<code>player.h</code>	Simple logic
<code>void setPosition(Player*, int)</code>	<code>player.h</code>	Simple logic
<code>void setCanPlay(Player*, int)</code>	<code>player.h</code>	Simple logic
<code>void setIndex(Player*, int)</code>	<code>player.h</code>	Simple logic

void setCash(Player*, int cash)	player.h	Simple logic
Position *initializeNewPosition(int)	player.h	Hard to test & lack of time
void pushPosition(Position**, int)	player.h	Hard to test & lack of time
void deallocatePositions(Position*)	player.h	Hard to test & lack of time
void cleanPlayers(Player*, int)	player.h	Hard to test & lack of time
void initializeGame(Game*)	game.h	Hard to test & lack of time
void rollDice(int*)	game.h	Simple logic
void makeTransaction(Game*)	game.h	Lack of time
void incrementTurn(Player**, Player**)	game.h	Hard to test
void cleanGame(Game*)	game.h	Hard to test & lack of time
void getFromBank(Game*)	game.h	Simple logic
void goToJail(Game*)	game.h	Simple logic
void sellProperty(Game*, int)	game.h	Lack of time
void playGame(Game*)	engine.h	Too integrated to test
void playTurn(Game*)	engine.h	Too integrated to test
void handleState(Game*)	engine.h	Too integrated to test
void handleInsufficientMoney(Game*)	engine.h	Lack of time
void handleInput(Game*)	engine.h	Too integrated to test & lack of time
void updateScreenElements(Game)	engine.h	Lack of time
void displayWinner(Player*)	engine.h	Simple logic