1.(a)

LEVEL 1

	Total
T	7
F	9
Gini = 0.492	

	RED	BLUE
T	4	3
F	4	5
Gini = 0.484		

	SMALL	LARGE
T	4	3
F	4	5
Gini =0.484		

	LOW	HIGH
T	1	6
F	7	2
Gini = 0.297		

	COOL	HOT
T	2	5
F	6	3
Gini = 0.422		

	2		3		6		7		10		11		16		17		25		27		29		33		34		36		45		50	
T	0	7	0	7	0	7	1	6	1	6	2	5	2	5	2	5	2	5	3	4	4	3	5	2	5	2	6	1	7	0	7	0
F	0	9	1	8	2	7	2	7	3	6	3	6	4	5	5	4	6	3	6	3	6	3	6	3	7	2	7	2	7	2	8	1
Gini	null		0.467		0.438		0.487		0.486		0.491		0.479		0.456		0.422		0.464		0.488		0.491		0.490		0.487		0.438		0.467	

For Level 1, we pick LOW/HIGH to split the tree.

LEVEL 2

For the left LOW approach:

	2		3		6		11		16		33		45		50	
T	0	1	0	1	0	1	1	0	1	0	1	0	1	0	1	0
F	0	7	1	6	2	5	2	5	3	4	4	3	5	2	6	1
Gini	null		0.214		0.208		0.167		0.188		0.2		0.208		0.214	

	RED	BLUE
T	1	0
F	4	3
Gini = 0.2		

	SMALL	LARGE
T	1	0
F	4	3
Gini =0.2		

	COOL	HOT
T	1	0
F	4	3
Gini =0.2		

For the right HIGH approach:

	7		10		17		25		27		29		34		36	
T	0	6	0	6	1	5	1	5	2	4	3	3	4	2	5	1
F	0	2	1	1	1	1	2	0	2	0	2	0	2	0	2	0
Gini	null		0.214		0.333		0.167		0.25		0.3		0.333		0.357	

	RED	BLUE
T	3	3
F	0	2
Gini = 0.3		

	SMALL	LARGE
T	3	3
F	0	2
Gini =0.3		

	COOL	HOT
T	1	5
F	2	0
Gini =0.167		

So, we can choose continuous attribute <11 / >=11 for left approach and also continuous attribute <25 / >= 25 for right approach.
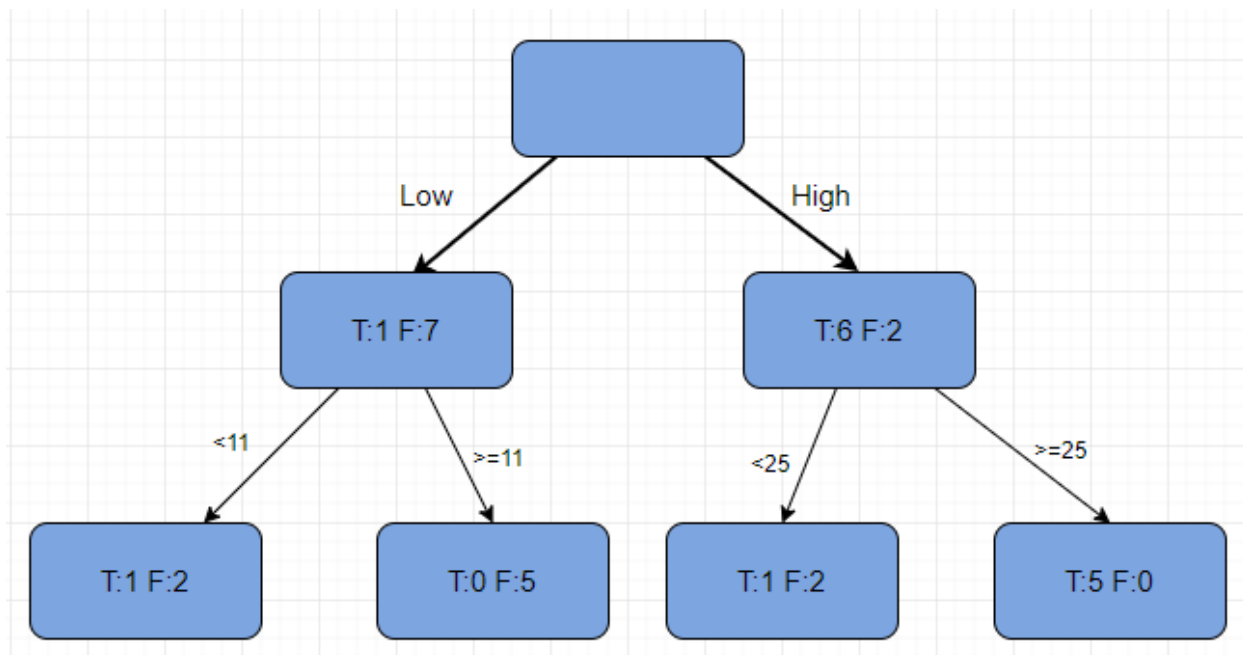
LEVEL 3

For the <11 approach,

	RED	BLUE
T	1	0
F	1	1
Gini = 0.333		

	SMALL	LARGE
T	1	0
F	1	1
Gini = 0.333		

For the <25 approach,

	RED	BLUE
T	1	0
F	0	2
Gini = 0		

	SMALL	LARGE
T	1	0
F	0	2
Gini = 0		

So, we can choose RED/BLUE for <11 approach and also RED/BLUE for <25 approach.

Tree diagram:
- Root node splits into "Low" (left) and "High" (right)
- Low → T:1 F:7
- High → T:6 F:2
- T:1 F:7 splits: <11 → T:1 F:2, >=11 → T:0 F:5
- T:6 F:2 splits: <25 → T:1 F:2, >=25 → T:5 F:0
- T:1 F:2 (left) splits: RED → T:1 F:1, BLUE → T:0 F:1
- T:1 F:2 (right) splits: RED → T:1 F:0, BLUE → T:0 F:2
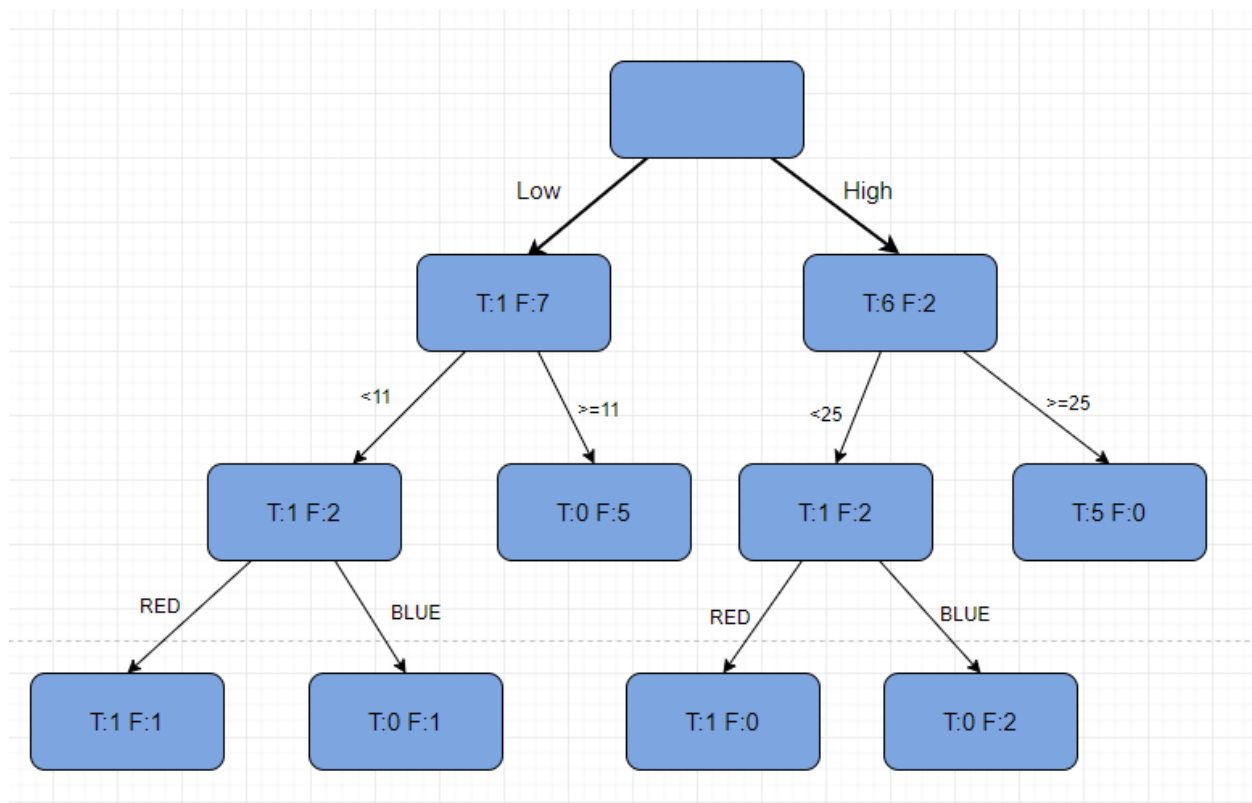
LEVEL 4

For the RED approach

	SMALL	LARGE
T	1	0
F	0	1
Gini = 0		

So the final tree is:

```
                          ┌──────────┐
                          │          │
                          └──────────┘
                   Low                    High
              ┌─────────┐            ┌─────────┐
              │ T:1 F:7 │            │ T:6 F:2 │
              └─────────┘            └─────────┘
           <11         >=11       <25          >=25
      ┌─────────┐  ┌─────────┐ ┌─────────┐  ┌─────────┐
      │ T:1 F:2 │  │ T:0 F:5 │ │ T:1 F:2 │  │ T:5 F:0 │
      └─────────┘  └─────────┘ └─────────┘  └─────────┘
     RED      BLUE            RED       BLUE
 ┌─────────┐ ┌─────────┐  ┌─────────┐ ┌─────────┐
 │ T:1 F:1 │ │ T:0 F:1 │  │ T:1 F:0 │ │ T:0 F:2 │
 └─────────┘ └─────────┘  └─────────┘ └─────────┘
 SMALL    LARGE
┌─────────┐ ┌─────────┐
│ T:1 F:0 │ │ T:0 F:1 │
└─────────┘ └─────────┘
```
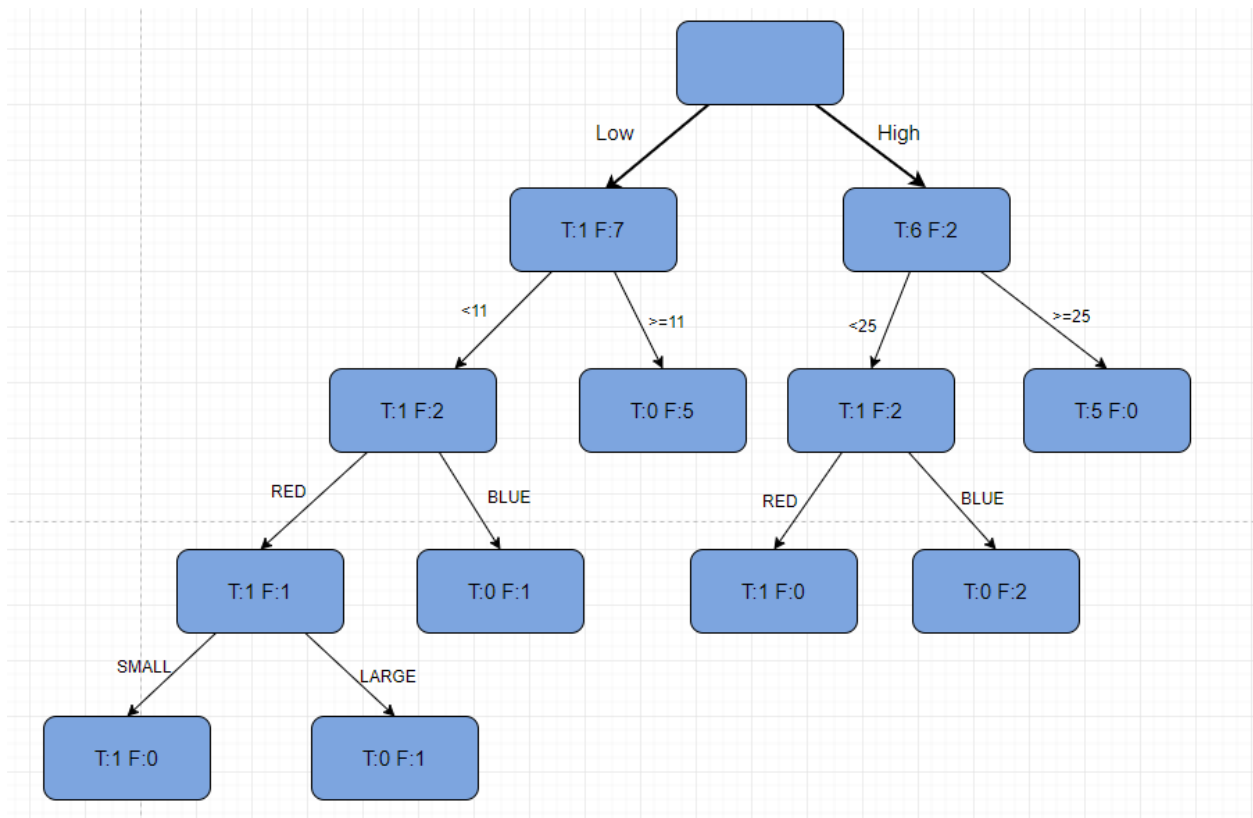
(b)

LEVEL 1

	Total
T	7
F	9
Entropy = 0.9887	

	RED	BLUE
T	4	3
F	4	5
Gain = 0.011		

	SMALL	LARGE
T	4	3
F	4	5
Gain =0.011		

	LOW	HIGH
T	1	6
F	7	2
Gain = 0.311		

	COOL	HOT
T	2	5
F	6	3
Gain = 0.106		

	2		3		6		7		10		11		16		17		25		27		29		33		34		36		45		50	
T	0	7	0	7	0	7	1	6	1	6	2	5	2	5	2	5	2	5	3	4	4	3	5	2	5	2	6	1	7	0	7	0
F	0	9	1	8	2	7	2	7	3	6	3	6	4	5	5	4	6	3	6	3	6	3	6	3	7	2	7	2	7	2	8	1
Gain	null		0.054		0.114		0.007		0.036		0.002		0.019		0.054		0.106		0.041		0.007		0.002		0.004		0.007		0.114		0.054	

As the LOW/HIGH attribute has the largest Gain, we choose it to build the first level.
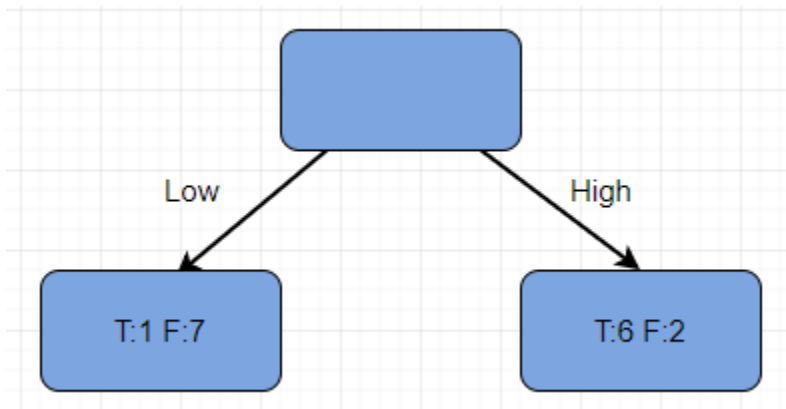
Level 2

For the left LOW approach:

	TOTAL
T	1
F	7
Entropy = 0.544	

	2		3		6		11		16		33		45		50	
T	0	1	0	1	0	1	1	0	1	0	1	0	1	0	1	0
F	0	7	1	6	2	5	2	5	3	4	4	3	5	2	6	1
Gain	null		0.026		0.056		0.200		0.138		0.093		0.056		0.026	

	RED	BLUE
T	1	0
F	4	3
Gain = 0.093		

	SMALL	LARGE
T	1	0
F	4	3
Gain =0.093		

	COOL	HOT
T	1	0
F	4	3
Gain =0.093		

For the right HIGH approach:

	TOTAL
T	6
F	2
Entropy = 0.811	

	7		10		17		25		27		29		34		36	
T	0	6	0	6	1	5	1	5	2	4	3	3	4	2	5	1
F	0	2	1	1	1	1	2	0	2	0	2	0	2	0	2	0
Gain	null		0.293		0.073		0.467		0.311		0.204		0.122		0.056	

	RED	BLUE
T	3	3
F	0	2
Gain = 0.204		

	SMALL	LARGE
T	3	3
F	0	2
Gain =0.204		

	COOL	HOT
T	1	5
F	2	0
Gain =0.467		

So, we can choose continuous attribute <11 / >=11 for left approach and also continuous attribute <25 / >= 25 for right approach.

```
                          ┌──────────┐
                          │          │
                          └──────────┘
                   Low   ╱            ╲   High
                        ╱              ╲
                ┌──────────┐      ┌──────────┐
                │  T:1 F:7 │      │  T:6 F:2 │
                └──────────┘      └──────────┘
              <11 ╱      ╲ >=11   <25 ╱    ╲ >=25
                 ╱        ╲          ╱      ╲
         ┌────────┐  ┌────────┐ ┌────────┐ ┌────────┐
         │ T:1 F:2│  │ T:0 F:5│ │ T:1 F:2│ │ T:5 F:0│
         └────────┘  └────────┘ └────────┘ └────────┘
```
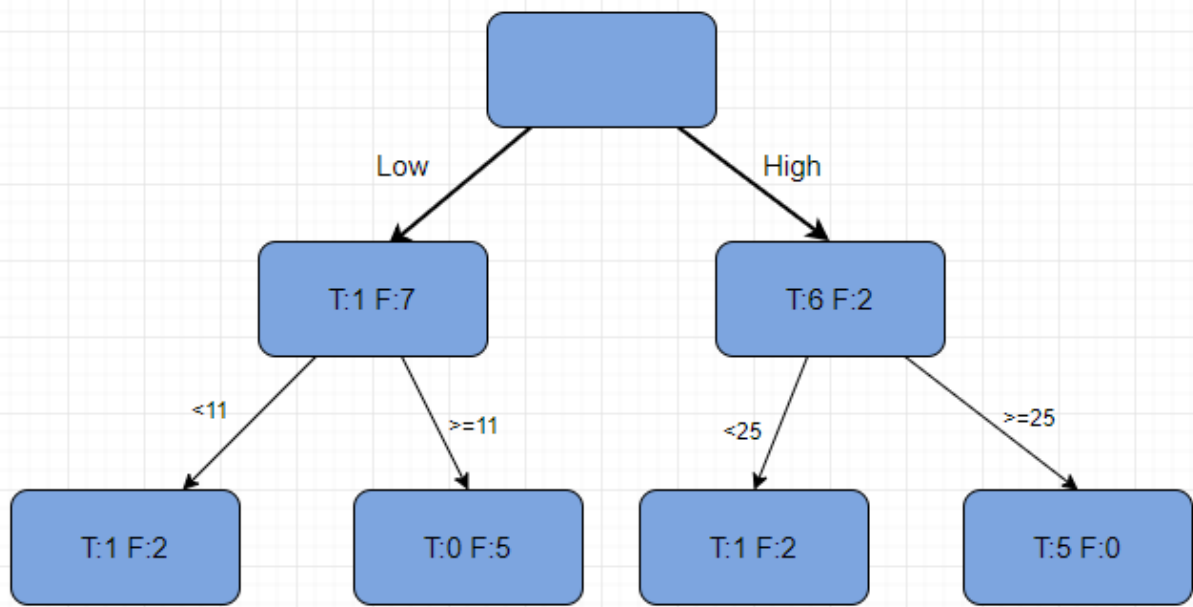
LEVEL 3

For the <11 approach,

	Total
T	1
F	2
Entropy = 0.918	

	SMALL	LARGE
T	1	0
F	1	1
Gain = 0.251		

	RED	BLUE
T	1	0
F	1	1
Gain = **0.251**		

For the <25 approach,

	Total
T	1
F	2
Entropy = 0.918	

	SMALL	LARGE
T	1	0
F	0	2
Gain = 0.918		

	RED	BLUE
T	1	0
F	0	2
Gain = **0.918**		

So, we can choose RED/BLUE for <11 approach and also RED/BLUE for <25 approach.
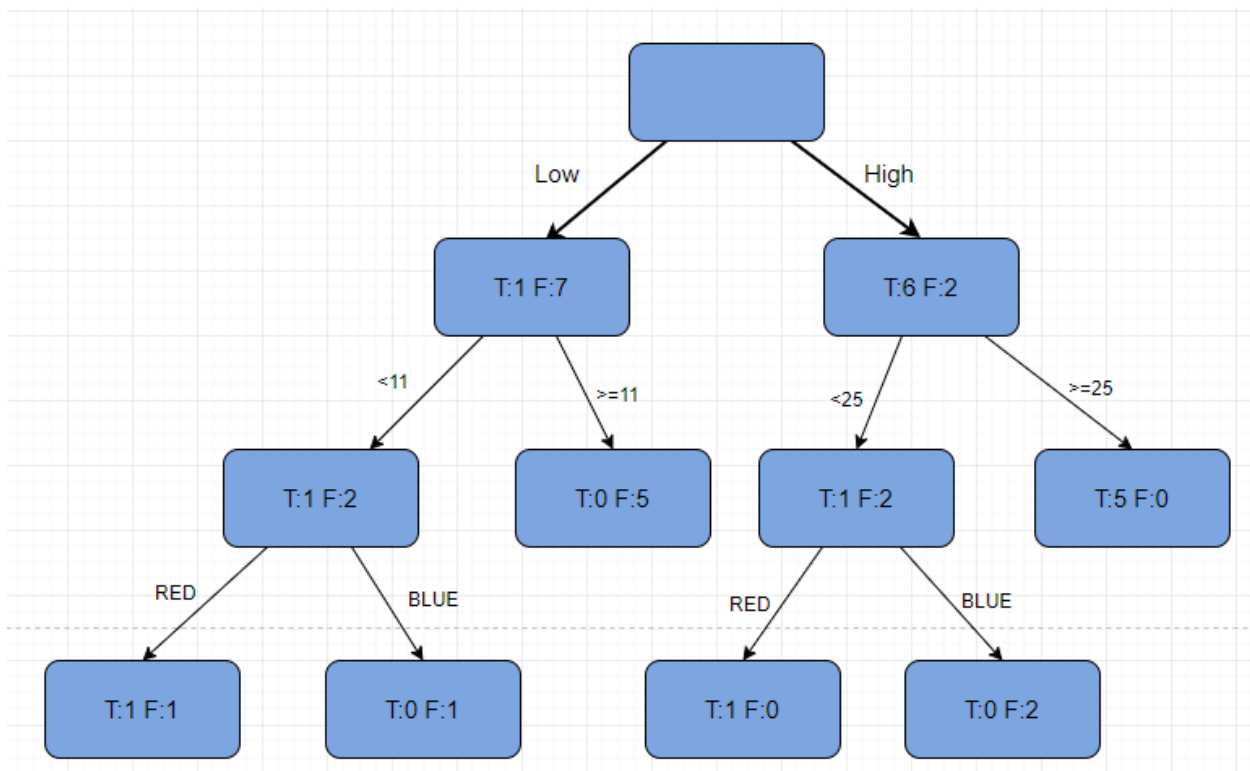
LEVEL 4

For the RED approach

	TOTAL
T	1
F	1
Entropy = 1	

	SMALL	LARGE
T	1	0
F	0	1
Gain = 1		

So the final tree is: