→ ↑

3 7 COMBINATION CHART Upper right corner 0 9

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
9	63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	109	110	111	112	115
8	56	59	62	65	68	71	74	77	80	83	86	89	92	95	98	101	102	103	104	105	108
7	49	52	55	58	61	64	67	70	73	76	79	82	85	88	91	94	95	96	97	98	101
6	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84	87	88	89	90	91	94
5	35	38	41	44	47	50	53	56	59	62	65	68	71	74	77	80	81	82	83	84	87
4	28	31	34	37	40	43	46	49	52	55	58	61	64	67	70	73	74	75	76	77	80
3	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	67	68	69	70	73
2	14	17	20	23	26	29	32	35	38	41	44	47	50	53	56	59	60	61	62	63	66
1	7	10	13	16	19	22	25	28	31	34	37	40	43	46	49	52	53	54	55	56	59
0	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	46	47	48	49	52

A TOUCHDOWN = 7 pts

A FIELD GOAL = 3 pts

WHICH SCORES 1 TO 25 ARE IMPOSSIBLE.

1, 2, 4, 5, 8, 11

3 = 1 FG

6 = 2 FG

7 = 1 TD

9 = 3 FG

10 = 1 TD, 1 FG

12 = 4 FG

13 = 1 TD, 2 FG

14 = 2 TD

15 = 5 FG

16 = 1 TD, 3 FG

17 = 2 TD, 1 FG

18 = 6 FG

19 = 1 TD, 4 FG

20 = 2 TD, 2 FG

21 = 3 TD OR 7 FG

22 = 1 TD, 5 FG

23 = 2 TD, 3 FG √X

24 = 3 TD, 1 FG OR 8 FG

25 = 1 TD, 6 FG

THERE ARE NO POSSIBLE COMBINATIONS OF TOUCHDOWNS AND FIELD GOALS TO PRODUCE SCORES OF 1, 2, 4, 5, 8, AND 11. BY USING A COMBINATION CHART, WE CAN FURTHER SEE THAT THESE SCORES DO NOT APPEAR ON THE CHART.

A TEAM CAN SCORE 40 POINTS IN TWO WAYS: √X

4 TOUCHDOWNS AND 4 FIELD GOALS	→ 4(7) + 4(3) = 40
1 TOUCHDOWN AND 11 FIELD GOALS	→ 1(7) + 11(3) = 40

First I made a list of all the points from 1–25. I then crossed out all the #'s that were divisible by either 3 and/or 7. This would eliminate some of the scores that could be possible. I circled the numbers that were left. I then went through each circled score & tried to see if there were numbers that were sums of 7 and/or 3. If they were, I crossed them out. The circled numbers were the possibilities.

(1)
(2)
~~3~~ divisible by 3
(4)
(5)
~~6~~ divisible by 3
~~7~~ divisible by 7.
(8)
~~9~~ divisible by 3
~~(10)~~ 7+3=10
(11)
~~12~~ divisible by 3
~~(13)~~ 3+3+7=13
~~14~~ divisible by 7.
~~15~~ divisible by 3
~~(16)~~ 7+3+3+3=16
~~(17)~~ 7+7+3=17
~~18~~ divisible by 3
~~(19)~~ 3+3+3+3+7=19
~~(20)~~ 3+3+7+7=20
~~21~~ divisible by 7 & 3
~~(22)~~ 3+3+3+3+3+7=22
~~24~~ divisible by 3.
~~(25)~~ 7+3+3+3+3+3+3=25

Answer: A team cannot score
1 point
2 points
4 points
5 points
8 points
11 points

1.

continued

All the ways a team can score 40 points

a.) 3(11) = 33
7(1) = 7
40 points

b.) 3(4) = 12
7(4) = 28
40 points.

These are the only ways possible. 40 is not divisible by 3 or 7 so there is no way there can be all 7's or all 3's. I guessed and checked.

2.

(2)

143	148	153	158	163	168	173	178	183	188	193	198	203	208	213	218
130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205
117	122	127	132	137	142	147	152	157	162	167	172	177	182	187	192
104	109	114	119	124	129	134	139	144	149	154	159	164	169	174	179
91	96	101	106	111	116	121	126	131	136	141	146	151	156	161	166
78	83	88	93	98	103	108	113	118	123	128	133	138	143	148	153
65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140
52	57	62	67	72	77	82	87	92	97	102	107	112	117	122	127
39	44	49	54	59	64	69	74	79	84	89	94	99	104	109	114
26	31	36	41	46	51	56	61	66	71	76	81	86	91	96	101
13	18	23	28	33	38	43	48	53	58	63	68	73	78	83	88
0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75

NUMBERS WE CAN'T MAKE: 1¢, 2¢, 3¢, 4¢, 6¢, 7¢, 8¢, 9¢, 11¢, 12¢, 14¢, 16¢, 17¢, 19¢, 21¢, 22¢, 24¢, 27¢, 29¢, 32¢, 34¢, 37¢, 42¢, 47¢

I ONLY HAVE 5¢ AND 13¢, WHAT POSTAGES CAN I MAKE WITH A SUFFICIENT NUMBER OF STAMPS?

↳ $5x + 13y$ = ALL POSSIBLE POSTAGES

- $5x$: 5¢ stamps, x = # of 5¢ stamps
- $13y$: 13¢ stamps, y = # of 13¢ stamps

WHAT IS THE LARGEST POSTAGE I CANNOT MAKE?

1 2 3 4 (5) 6 7 8 9 (10) 11 12 (13) 14 (15)
16 17 (18) 19 (20) 21 22 (23) 24 (25) (26) 27 (28) 29
(30) 31 32 (33) 34 (35) (36) 37 (38) 39 (40) (41) 42 (43)
(44) (45) (46) 47 (48) (49) (50) (51) (52) (53) (54) (55)

47¢ IS THE LARGEST POSTAGE THAT CANNOT BE MADE. AFTER 47¢ EVERY POSTAGE IS POSSIBLE AND THERE IS A DISCERNIBLE PATTERN ON THE COMBINATION CHART.

→ ↑

0.06 0.15 COMBINATION CHART Upper right corner is 0 20

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
20	3.00	3.06	3.12	3.18	3.24	3.30	3.36	3.42	3.48	3.54	3.60	3.66	3.72	3.78	3.84	3.90	4.90	5.90	6.9
19	2.85	2.91	2.97	3.03	3.09	3.15	3.21	3.27	3.33	3.39	3.45	3.51	3.57	3.63	3.69	3.75	4.75	5.75	6.7
18	2.70	2.76	2.82	2.88	2.94	3.00	3.06	3.12	3.18	3.24	3.30	3.36	3.42	3.48	3.54	3.60	4.60	5.60	6.6
17	2.55	2.61	2.67	2.73	2.79	2.85	2.91	2.97	3.03	3.09	3.15	3.21	3.27	3.33	3.39	3.45	4.45	5.45	6.4
16	2.40	2.46	2.52	2.58	2.64	2.70	2.76	2.82	2.88	2.94	3.00	3.06	3.12	3.18	3.24	3.30	4.30	5.30	6.3
15	2.25	2.31	2.37	2.43	2.49	2.55	2.61	2.67	2.73	2.79	2.85	2.91	2.97	3.03	3.09	3.15	4.15	5.15	6.1
14	2.10	2.16	2.22	2.28	2.34	2.40	2.46	2.52	2.58	2.64	2.70	2.76	2.82	2.88	2.94	3.00	4.00	5.00	6.0
13	1.95	2.01	2.07	2.13	2.19	2.25	2.31	2.37	2.43	2.49	2.55	2.61	2.67	2.73	2.79	2.85	3.85	4.85	5.8
12	1.80	1.86	1.92	1.98	2.04	2.10	2.16	2.22	2.28	2.34	2.40	2.46	2.52	2.58	2.64	2.70	3.70	4.70	5.7
11	1.65	1.71	1.77	1.83	1.89	1.95	2.01	2.07	2.13	2.19	2.25	2.31	2.37	2.43	2.49	2.55	3.55	4.55	5.5
10	1.50	1.56	1.62	1.68	1.74	1.80	1.86	1.92	1.98	2.04	2.10	2.16	2.22	2.28	2.34	2.40	3.40	4.40	5.4
9	1.35	1.41	1.47	1.53	1.59	1.65	1.71	1.77	1.83	1.89	1.95	2.01	2.07	2.13	2.19	2.25	3.25	4.25	5.2
8	1.20	1.26	1.32	1.38	1.44	1.50	1.56	1.62	1.68	1.74	1.80	1.86	1.92	1.98	2.04	2.10	3.10	4.10	5.1
7	1.05	1.11	1.17	1.23	1.29	1.35	1.41	1.47	1.53	1.59	1.65	1.71	1.77	1.83	1.89	1.95	2.95	3.95	4.9

#3) $0.15 ⟌ $2.86 ≈ 19.0666666667.

$0.15 × 19 =	$2.85	+ 0 ($0.06) =	$2.85	× under
$0.15 × 18 =	$2.70	+ 3 ($0.06) =	$2.88	× over
$0.15 × 17 =	$2.55	+ 5 ($0.06) =	$2.85	× under
$0.15 × 16 =	$2.40	+ 8 ($0.06) =	$2.88	× over
$0.15 × 15 =	$2.25	+ 10 ($0.06) =	$2.85	× under
$0.15 × 14 =	$2.10	+ 15 ($0.06) =	$2.85	× under
$0.15 × 13 =	$1.95	($0.06)		
$0.15 × 12 =	$1.80	($0.06)		
$0.15 × 11 =	$1.65	($0.06)		
$0.15 × 10 =	$1.50	($0.06)		
$0.15 × 9 =	$1.35	($0.06)		
$0.15 × 8 =	$1.20	($0.06)		
$0.15 × 7 =	$1.05	($0.06)		
$0.15 × 6 =	$0.90	($0.06)		
$0.15 × 5 =	$0.75	($0.06)		
$0.15 × 4 =	$0.60	($0.06)		
$0.15 × 3 =	$0.45	($0.06)		
$0.15 × 2 =	$0.30	($0.06)		
$0.15 × 1 =	$0.15	($0.06)		

2/

$0.06 ⟌ $2.86 ≈ 47.6666666667

$0.06 × 48 = $2.88 × over

I realized that there was a pattern. I then looked at a combination chart to verify my pattern. It will never hit $2.86. It will either go to $2.85, $2.88 or $2.91. Look at the combination chart combined.

3. ONLY 6¢ AND 15¢ STAMPS ARE AVAILABLE. THE COST OF A PACKAGE IS $2.86. CAN THESE STAMPS MAKE THIS EXACT AMOUNT? NO ALL PRIMES

$6x + 15y = 286$ → HAS FACTORS OF 2, 11, 13

THE LEFT SIDE OF THE EQUATION ARE BOTH MULTIPLES OF 3 AND THE RIGHT SIDE IS NOT.

First of all, Joe counts 48 heads, which means there are only 48 animals. Now by using the amount of legs, we need to determine how many dogs and chickens there are. Assuming that they're all chickens, we can do $48(2)=96$ $134-96=38$, if they were all chickens we'd be short 38 legs so this can't be true. So now I going to replace a chicken with a dog, which gives me 2 more legs than before. The number of legs I still need is 38 and if I keep replacing chickens with dogs, I will gain 2 more legs. To find out how many dogs I would need, I can do $38 \div 2 = 19$ Then I take the 48 chickens, I started out with and subtract 19. $48-19=29$ which gives me the number of chickens.
$19(4)+29(2)=134$
Joe has 19 dogs and 29 chickens

134 LEGS

48 HEADS { CHICKEN (2 LEGS)
DOG (4 LEGS)

2 Equations can be made... (Chicken = C / Dog = D)

$$\begin{cases} 1C + 1D = 48 \;/\; C + D = 48 \\ 2C + 4D = 134 \end{cases}$$

The first equation can be written as...

$C = 48 - D$

or

✓ $D = 48 - C$

either one can be substituted

↳ $2C + 4(48 - C) = 134$

$2C + 192 - 4C = 134$

$-2C = -58$

$2C = 58$

$C = 29$

From this, we can plug back to the original first equation to find the number of each animal.

↳ $C + D = 48$

$29 + D = 48$

$D = 19$

There are 19 DOGS & 29 CHICKEN

5

84	93	102	111	120	129	138	147	156	165	174	183	192	201	210	219
80	89	98	107	116	125	134	143	152	161	170	179	188	197	206	215
76	85	94	103	112	121	130	139	148	157	166	175	184	193	202	211
72	81	90	99	108	117	126	135	144	153	162	171	180	189	198	207
68	77	86	95	104	113	122	131	140	149	158	167	176	185	194	203
64	73	82	91	100	109	118	127	136	145	154	163	172	181	190	199
60	69	78	87	96	105	114	123	132	141	150	159	168	177	186	195
56	65	74	83	92	101	110	119	128	137	146	155	164	173	182	191
52	61	70	79	88	97	106	115	124	133	142	151	160	169	178	187
48	57	66	75	84	93	102	111	120	129	138	147	156	165	174	183
44	53	62	71	80	89	98	107	116	125	134	143	152	161	170	179
40	49	58	67	76	85	94	103	112	121	130	139	148	157	166	175
36	45	54	63	72	81	90	99	108	117	126	135	144	153	162	171
32	41	50	59	68	77	86	95	104	113	122	131	140	149	158	167
28	37	46	55	64	73	82	91	100	109	118	127	136	145	154	163
24	33	42	51	60	69	78	87	96	105	114	123	132	141	150	159
20	29	38	47	56	65	74	83	92	101	110	119	128	137	146	155
16	25	34	43	52	61	70	79	88	97	106	115	124	133	142	151
12	21	30	39	48	57	66	75	84	93	102	111	120	129	138	147
8	17	26	35	44	53	62	71	80	89	98	107	116	125	134	143
4	13	22	31	40	49	58	67	76	85	94	103	112	121	130	139
0	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135

(4, 21) (8, 12) (12, 3)

(C) COW = 10 PIECES OF GOLD — 220 PIECES OF
(P) PIG = 5 PIECES OF GOLD — GOLD ARE USED
(H) HEN = 1 PIECE OF GOLD — TO BUY 100 ANIMALS

→ HOW MANY OF EACH?

$C+P+H = 100$ ANIMALS

$10C+5P+H = 220$ GOLD PIECES

$10C+5P+H = 220$

$-(C+P+H = 100)$

$9C+4P = 120$

POSSIBLE SOLUTION SETS FOR (C,P) ARE:

(12,3) AND (8,12) AND (4,21)

$C+P+H = 100$ ANIMALS

$12+3+H = 100$ $\quad H = 85$

$8+12+H = 100$ $\quad H = 80$

$4+21+H = 100$ $\quad H = 75$

SO YOU CAN BUY
12 COWS, 3 PIGS, 85 HENS OR
8 COWS, 12 PIGS, 80 HENS OR
4 COWS, 21 PIGS, 75 HENS FOR 220 GOLD PIECES

$10(12)+5(3)+85 = 220$

$10(8)+5(12)+80 = 220$

$10(4)+5(21)+75 = 220$

cows (10)	pig (5)	hen (1)	Total animal
22	0	0	22
20	4	0	24
20	0	20	40
15	0	70	85
10	0	120	130
10	5	95	120
10	10	70	90
10	15	45	70
5	20	70	95
4 (40)	21 (105)	75 (75)	100 (220 pieces)

There are 4 cows, 21 pigs, and 75 hens purchased to give 100 animals for 220 gold pieces. (I used guess and check)