PROBLEM SOLVING

Set C

Solutions

There are many commercial resources available to challenge students to become better problem solvers. This is a collection of some of our favorite problems.

You might consider allowing students to work with partners. Many of these problems are best solved with calculators. All of these problems lend themselves to students telling and writing about their thinking.

Consider expanding this problem solving deck by adding your own problems on the backs of the cards or photocopying the blank master we have included for you.

We hope you will share your great problems with us. Send them to :

Mathematics Section
Department of Public Instruction
301 N. Wilmington St.
Raleigh, NC 27601-2825

1) Answers will vary.

2) $3.75 unless he is allowed to pay the 6 hr. rate

3)

Copies	Tip Copy Service	Kurt's Kwik Print
10	$2.35	$1.00
30	$3.05	$3.00
50	$3.75	$5.00
100	$5.50	$6.50
200	$9.00	$9.50
500	$19.50	$18.50
1000	$37.00	$33.50

4)

Alba	March	1981
Michael	April	1980
Tyrone	February	1975

5) One possible solution:
Fold the 3 and 6 panel behind the 4 and 5 panel. Then fold the top half forward, over the bottom half.
Now fold the 3 panel to right over the middle panel and the right side over the middle . Turn the packet over and the numbers are in order!

6) Answers will vary.

7) Answers will vary.

8) 45
Segments:
AB, AC, AD, AE ,AF
BC, BD, BE, BF
CD, CE, CF
DE, DF
EF
Yes, they are related. The principle involved is the number of combinations of N things taken M at a time. In the first case number of combinations of ten people taken 2 at a time. In the second case, the number of combinations of six points taken 2 at a time.

9) Answers will vary. Yes, the sum will be 18.

10) .5 meter

11) Grades 5 and 6 may wish to cut out the figure and discover the relationships between the components, i.e. the combined area of the four small, white triangles(A) = the area of the small black square(B). The area of the four large, black triangles is equal to A + B or C. The area of the four large, white triangles is equal to A + B + C or D.
A = 50 square cm; B = 50 square cm;
C = 100 square cm; D = 200 square cm

Grades 6 and 7 and should use the Pythagorean relationship to arrive at similar conclusions.

12) Note 0.8 cents is a part of one cent or $0.008

Coin	No. in $5	Cost for 1	Total Cost
penny	500	0.008	$4.00
nickel	100	0.029	$2.90
dime	50	0.017	$0.85
quarter	20	0.037	$0.74
half-dollar	10	0.078	$0.78

13) If the month has 31 days **1** will appear 14 times and **2** will appear 13 times.

If the month has 30 days **1** and **2** appear an equal number of times - 13.

If February has 28 days then **1** appears 13 times and **2** appears 12 times. In leap years, **1** and **2** appear an equal number of times - 13.

14) If it is digital, no contest - when it doesn't work it is blank! For an analog clock, to lose a minute an hour means it is right once and then not again for 720 hours. One minute's loss an hour x 60 makes it one hour behind. In the passage of 720 hours the clock will be 12 hours behind or right again! On the other hand a brocken clock is right twice a day.

15) Answers will vary. One-sixth is brown.

16) Answers will vary.

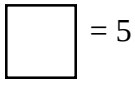
17) Answers will vary.

18) Four will have 4 blue faces and three will have 5 blue faces and one will have 3 blue faces.

19) 4, 10, 16, 22, 28, 34, 40, 46, 52, 58
9, 18, 27, 36, 45, 54, 63, 72, 81, 90

20) Wednesday is the 21st; the 17th is a Saturday; February 14th is also a Wednesday.

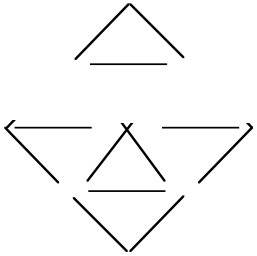
21) Nine minutes or Never! After 9 minutes he is 0.1953125 feet away or alittle over 2 inches from the tree.

22)  = 5  = 7

23) b is 100th; 12 if the pattern is doubling.

24) 48

25) 220; 163

26) 

27) Open all four links in one short chain. Use three of the open links to join the other three short chains. Now the last open link can join the ends for a continuous necklace.
Cost: 4 openings @$3.00 each + 4 closings at $4.00 each = $28.00.

28) 9; yes, 6.

29) $20.00 profit.

30) 45 cubes;

# of cubes	# of painted faces
0	6
0	5
0	4
8	3
20	2
14	1
3	0

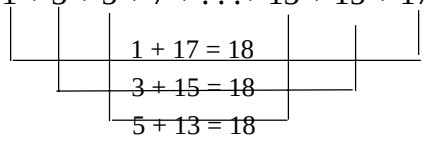
31) 13 go-carts, 17 tricycles.

32) 72 minutes.

33) Rosa has seven nickels.

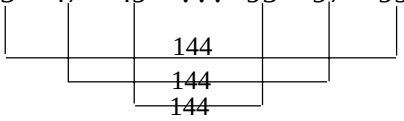
34) 3/30/90; 5/18/90; 9/10/90; 10/9/90.
Bastille Day (7/14) and Christmas Eve (12/24) are equivalent to 1/2. Ten other dates 1/2; 2/4; 3/6; 4/8; 5/10; 6/12; 8/16; 9/18; 10/20; 11/22 fit this pattern.

35) 1 + 3 + 5 + 7 + . . .+ 13 + 15 + 17 = ?



There are 4 1/2 of these "pairs" so the sum is 4.5 x 18 or 81.

45 + 47 + 49 + . . . 95 + 97 + 99 = ?



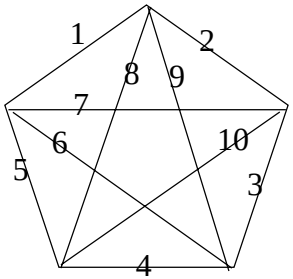
There are 14 "pairs" or 14 x 144 = 2 016.

36) 8/20; 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 x 9.
Order of operations!

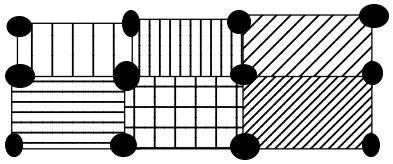
37) Thirteen. When 12 are in the group each could have unique birth months, but a 13th person will have a birth month that matches one of the other persons.

38) Answers will vary.

39) Ten



40) Answers will vary.
Twelve tacks. If the edges overlap slightly the following array will work:



41) 120 outfits

42) Six hours - $1.26
Ten hours - $20.46
Eight hours for at least $5.00

43) Bob - 1, Rick - 9, Maria - 8.

44) Sixth number - 40.
No. The number of tests taken is needed.

45) Answers will vary. Here are some:

# right x 10	-	**# wrong x 1**	=	**Score**
5 x 10	-	5 x 1	=	45
6 x 10	-	15 x 1	=	45
7 x 10	-	25 x 1	=	45
8 x 10	-	35 x 1	=	45
9 x 10	-	45 x 1	=	45
10 x 10	-	55 x 1	=	45

etc.

46) Average speed is $\frac{\textbf{Total Miles}}{\textbf{Total Time}}$

$\textbf{Time} = \frac{\textbf{Distance}}{\textbf{Speed}}$

to the mountains: $600 \div 50 = 12$
from the mountains: $600 \div 55 = 10.90\overline{90}$

So, average speed is $\frac{600 + 600}{12 + 10.90\overline{90}}$

or ~ 58.381 miles per hour.

Since Distance = Rate x Time, you will need to know two of the quantities to solve future problems.

47) 6, 8, 12, 16, 24, 32, 48, 96 all divide 100 and have a remainder 4. 96 is the largest.
10, 14, 15, 21, 30, 35, 42, 70, 105 all divide 216 and have a remainder 6.

48) Yes.

Year born	**Age in**	**Year**
1	1	1
2	2	4
6	3	9
12	4	16
20	5	25
30	6	36

48) Yes.

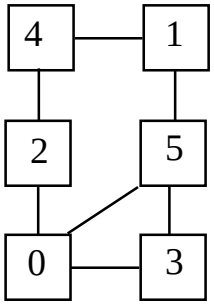
	Year born	**Age**	**in**	**Year**
	42	7		49
	56	8		64
	72	9		81
	90	10		100
	110	11		121
	132	12		144
	156	13		169
	182	14		196
	210	15		225
	240	16		256
	272	17		289
	306	18		324
	342	19		361
	380	20		400
	420	21		441
	462	22		484
	506	23		529
	.	.		.
	.	.		.
	.	.		.
until	1560	40		1600
	1640	41		1681
	1724	42		1764
	1806	43		1849
	1892	44		1936
	1980	45		2025
	2070	46		2116

and so on!

49) 85, 86, 87, 88, 89, 90

50) Eight days.

51) Answers will vary. Here's one:



52) Nine feet.

53) Answers will vary.

54) Just one 768. Answers should relate to the fact that if a number is divisible by nine then the sum of its digits is divisible by nine.

55) Condition **1**: 33 numbers

0 -100	11
101 - 200	11
201 - 300	11

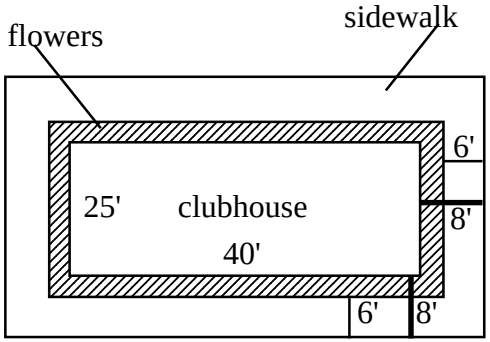
Condition **2**: 24 numbers

0 -100	8
101 - 200	8
201 - 300	8

Condition **3**: 27 numbers

0 -100	9
101 - 200	9
201 - 300	9

56)



perimeter 194 ft.; area of sidewalk 1 020 sq.ft.

57) Three ; (2,5,5) isosceles, (3,4,5) right, (4,4,4) equilateral.

58) Area: ~71 415.9 square feet
Perimeter: ~1 028.3 feet

59) 1) 8; 2) 12; 3) 6; 4) 1; 5) 54

60) A. 40 pennies, 2 dimes, and 8 nickels = $1.00
B. Answers will vary.

61) Yes. See answer to card 37

62) 800 letters by the 100th week; 500 letters by the 63rd week.

Week Number	Letters this week	Letters received
1	8	8
2	8	16
3	8	24
4	8	32
5	8	40
6	8	48
7	8	56
8	8	64

63) $0.31