# Math 135: Intermediate Algebra 

Homework 2 Solutions
October 9, 2007
Section 2.3, page 147

1. $3 \mathrm{x}-7>-2 ; 3(2)-7>-2 ; 6-7>-1$; so $-1>-2$

Since this statement is true, $\mathrm{x}=2$ is a solution.
3. $\mathrm{n} / 4+10 \leq 8 ;-8 / 4+10 \leq 8 ;-2+10 \leq 8 ; 8 \leq 8$

Since this statement is true, $\mathrm{n}=-8$ is a solution.
5. $23-5 \mathrm{x} \geq 2 \mathrm{x}+9 ; 23-5(10) \geq 2(10)+9 ;-27 \geq 29$

Since this statement is false, $\mathrm{x}=10$ is not a solution.
7. $2 \mathrm{y} / 3+8<3 \mathrm{y} / 4+6 ; 2(-12) / 3+8<3(-12) / 4+6 ; 0<-3$ This statement is false, so $\mathrm{y}=-12$ is not a solution.
9. $4(24 \mathrm{n}+1)+16>40 \mathrm{n}-2 ; 4(24(-3 / 8)+1)+16>40(-3 / 8)-2 ;-16>-17$

Since this is a true statement, $n=-3 / 8$ is a solution.
11.
$(-\infty,-1)$

13.
$[2, \infty)$

15.
$\left(-3 \frac{1}{2}, \infty\right)$

17.
$(-\infty, 7.5]$

19.
$\mathrm{n}+5 \geq 3 ; \mathrm{n} \geq-2 ;[-2, \infty)$

21.
$\mathrm{y}-3<-7 ;$ y $<-4 ;(-\infty,-4)$

23.
$\mathrm{x}+1 / 2>-11 / 2 ; \mathrm{x}>-2 ;(-2, \infty)$

25.
$-6.5 \geq \mathrm{y}-4.5 ;-2 \geq \mathrm{y} ; \mathrm{y} \leq-2 ;(-\infty,-2]$

27.
$2 \mathrm{x}-9<\mathrm{x}-6 ; \mathrm{x}-9<-6 ; \mathrm{x}<3 ;(-\infty, 3)$

29.
$9 \mathrm{x}+5 \geq 8 \mathrm{x}+5 ; \mathrm{x}+5 \geq 5 ; \mathrm{x} \geq 0 ;[0, \infty)$

31.
$1.7-2.8 \mathrm{x} \leq 3.2-3.8 \mathrm{x} ; 1.7+\mathrm{x} \leq 3.2 ; \mathrm{x} \leq 1.5 ;(-\infty, 1.5]$

33.
$4 \mathrm{x} / 5 \geq-8 ; \mathrm{x} \geq-10 ;[-10, \infty)$

35.
$-3 \mathrm{n}<15 ; 3 \mathrm{n}>-15 ; \mathrm{n}>-5 ;(-5, \infty)$

37.
$-90 \leq-15 y ; 90 \geq 15 y ; 15 y \leq 90 ;$ y $\leq 6 ;(-\infty, 6]$

41. $2-\mathrm{x} \leq 1$; $-\mathrm{x} \leq-1 ; \mathrm{x} \geq 1$. This is shown by graph (c).
43. $-11<2 \mathrm{x}-9 ; 2 \mathrm{x}-9>-11 ; 2 \mathrm{x}>-2 ; \mathrm{x}>-1$. This is shown by graph (d).
45.

$$
\begin{aligned}
2 x+5 & \leq 13 \\
2 x & \leq 8 \\
x & \leq 4
\end{aligned}
$$

47. 

$$
\begin{aligned}
9-\frac{x}{3} & <-5 \\
-\frac{x}{3} & <-14 \\
x & >42
\end{aligned}
$$

49. 

$$
\begin{aligned}
11 y+9 & \geq 8 y \\
9 & \geq-3 y \\
-3 & \leq y
\end{aligned}
$$

51. 

$$
\begin{aligned}
6 y & <-18 y \\
24 y & <0 \\
y & <0
\end{aligned}
$$

53. 

$$
\begin{aligned}
3 y-13 & >15-y \\
4 y-13 & >15 \\
4 y & >28 \\
y & >7
\end{aligned}
$$

55. 

$$
\begin{aligned}
\frac{2}{3} x+6 & \geq \frac{4}{5} x+9 \\
-\frac{2}{15} x+6 & \geq 9 \\
-\frac{2}{15} x & \geq 3 \\
x & \leq-\frac{45}{2}
\end{aligned}
$$

57. 

$$
\begin{aligned}
2.8 z-1.3 & >-1.6 z-0.2 \\
4.4 z-1.3 & >-0.2 \\
4.4 z & >1.1 \\
z & >0.25
\end{aligned}
$$

59. 

$$
\begin{aligned}
3 n-2-n & >5 n+19 \\
2 n-2 & >5 n+19 \\
-3 n-2 & >19 \\
-3 n & >21 \\
n & <-7
\end{aligned}
$$

61. 

$$
\begin{aligned}
17 n-8 n+14 & \leq 13 n-10+6 \\
9 n+14 & \leq 13 n-4 \\
-4 n+14 & \leq-4 \\
-4 n & \leq-18 \\
n & \geq \frac{9}{2}
\end{aligned}
$$

63. 

$$
\begin{aligned}
3(2 x-1)-4 & \geq 7 x-12 \\
6 x-7 & \geq 7 x-12 \\
-x-7 & \geq-12 \\
-x & \geq-5 \\
x & \leq 5
\end{aligned}
$$

71. It costs $\$ 5$ per day for parking at a local parking garage. The owner of the garage offers a monthly parking pass that costs $\$ 60$. For what number of days is the daily parking rate a better deal ?

Let $n$ be the number of days of parking. The cost of daily parking is $5 n$, and it is cheaper than the $\$ 60$ pass if $5 n<60$. Solving, this is $n<12$, so daily parking is a better deal if you park fewer than 12 days per month.
73. A cellular phone calling plan costs $\$ 29.99$ per month for unlimited calling within the plan's network and $\$ 0.79$ per minute (or part thereof) for calls outside the network. How many minutes of calls outside the network can you make if you want your cell phone bill to be less than $\$ 50$ per month?

Let $m$ be the number of minutes of calls outside the network. The total price is $\$ 29.99+0.79 \mathrm{~m} \$$, so for the price to be less than $\$ 50$ per month we have

$$
\begin{aligned}
29.99+0.79 m & <50 \\
0.79 m & <20.01 \\
m & <25
\end{aligned}
$$

where we've rounded $m$ down to the nearest whole number because cell phone plans come in whole minutes. This means you must make 25 or fewer minutes of out of network calls per month.
75. A nurse planning a seven day vacation estimates that it will cost $\$ 486$ for the airfare, $\$ 170$ for the rental car, and $\$ 654$ for the hotel. If she wants to spend at most $\$ 2500$ for the entire vacation, how much can she spend per day on remaining expenses?

Let $c$ be the cost per day. The total cost for 7 days is $7 c+486+170+654=1310$, so to keep to a budget of $\$ 2500$,

$$
\begin{aligned}
7 c+1310 & \leq 2500 \\
7 c & \leq 1190 \\
c & \leq 170
\end{aligned}
$$

She can spend at most $\$ 170$ per day.
77. The profits for a small business in the first three quarters of the year were \$120,356, \$96,147 and $\$ 85,502$. What must be the company's profit for the fourth quarter in order to show an average quarterly profit of at least \$100,000?

Let $p$ be the profit for the fourth quarter. The average profit is the sum of the four quarter profits divided by 4 , i.e. $(p+120,356+96,147+85,502) / 4=(p+302,005) / 4$. For the average profit to be $\$ 100,000$ we require

$$
\begin{aligned}
\frac{1}{4}(p+302,005) & \geq 100,000 \\
p+302,005 & \geq 400,000 \\
p & \geq 97,995
\end{aligned}
$$

The fourth quarter profit must be at least $\$ 97,995$.
83. A local courier service estimates that its monthly operating cost is $\$ 1500$ plus $\$ 0.85$ per delivery. If the service generates revenue of $\$ 6$ for each delivery, how many deliveries must be made per month in order for the monthly revenue to exceed the monthly cost?

Let $d$ be the number of deliveries. The operating cost is $1500+0.85 d$, and the revenue is $6 d$. To make a profit, the company requires

$$
\begin{aligned}
6 d & >1500+0.85 d \\
5.15 d & >1500 \\
d & >292
\end{aligned}
$$

where we have rounded up because the company must make a whole number of deliveries. The company makes a profit if it makes at least 292 deliveries per month.

## Section 2.4, page 161

1. $(2,5)$

2. $[-3,0)$

3. $(-\infty,-4) \cup(3, \infty)$

4. $(-\infty,-2) \cup[0.5, \infty)$

5. 


11.

$$
\begin{aligned}
& \frac{2}{3} t>-4 \quad \text { and } \quad 9-4 t \geq-11 \\
& t>-6 \quad \text { and } \quad t \leq 5 \\
& -6<t \leq 5
\end{aligned}
$$

13. 

$$
\begin{array}{rcc}
7 \leq 6 x+1 & \text { and } & -4 x \geq 28 \\
1 \leq x & \text { and } & x \leq-7 \\
& \text { No solution } &
\end{array}
$$

15. 


17.

21.

23.

25.

35.

$$
\begin{array}{rcl}
7 x-9>4 x-18 & \text { and } & 6 x+5<x \\
3 x>-9 & \text { and } & 5 x<-5 \\
x>-3 & \text { and } & x<-1 \\
& -3<x<-1 &
\end{array}
$$

37. 

$$
\begin{array}{rll}
5 x+9 \leq 6 x-3 & \text { or } & 10 x-7<4 x+5 \\
-x \leq-12 & \text { or } & 6 x<12 \\
x \geq 12 & \text { or } & x<2
\end{array}
$$

39. 

$$
\begin{array}{rll}
3 x-9 \leq-2-\frac{x}{2} & \text { and } & 15 x-20 x<-40 \\
\frac{7}{2} x \leq 7 & \text { and } & -5 x<-40 \\
x \leq 2 & \text { and } & x>8
\end{array}
$$

No solution
53. To receive a $B$ in an intermediate algebra course, a student's exam average must be between 83 and 87. Suppose the student scored 87, 82 and 80 on the first three exams of the semester. What are the possible scores she can get on the fourth exam to have a $B$ average for the semester?

Let $s$ be the score on the last exam. The average score is $(87+82+80+s) / 4=(249+s) / 4$, and this must be between 83 and 87 . Therefore

$$
\begin{array}{rcl}
83 \leq & \frac{1}{4}(s+249) & \leq 87 \\
332 \leq & s+249 & \leq 348 \\
83 \leq & s & \leq 99
\end{array}
$$

The student must get between 83 and 99 on the final test.
57. Named after the Austrian physicist Ernst Mach, Mach numbers are associated with supersonic speeds. The Mach number is the ratio, or quotient, of the speed at which you're travelling to the speed of sound. An
airplane flies through air, for which the speed of sound is about 740 m.p.h. What is the range of speeds of aircraft whose Mach numbers are between 1.0 and 2.0?

Let $s$ be the speed of the craft. The Mach number is $\mathrm{M}=s / 740$, so to be between Mach 1.0 and 2.0 requires

$$
\begin{aligned}
1.0 & \leq \frac{s}{740} \\
740 & \leq 2.0 \\
& s
\end{aligned}
$$

The speed must be between 740 mph and 1480 mph to be between Mach 1.0 and 2.0.
59. The cost of a wedding reception is $\$ 2,500$ plus $\$ 50$ for each guest. If a couple would like to keep the cost of the reception between $\$ 7,500$ and $\$ 10,000$, how many guests can the couple invite?

Let $g$ be the number of guests. The cost is $2500+50 g$. For the cost to be between $\$ 7,500$ and $\$ 10,000$ requires

$$
\left.\begin{array}{rccl}
7,500 & \leq & 2500+50 g & \leq 10,000 \\
5,000 & \leq & 50 g &
\end{array}\right)
$$

They can invite between 100 and 150 guests.

