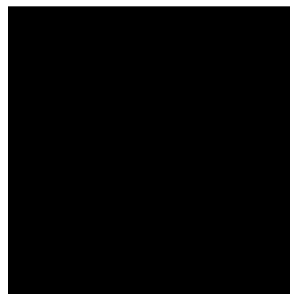


# **SkillsUSA 2014 Contest Projects**

## **Medical Math**



Click the “Print this Section” button above to automatically print the specifications for this contest. Make sure your printer is turned on before pressing the button.



**Medical Math  
National Competition  
June 2014**

1. Naegele's rule is a standard way of calculating the due date for a pregnancy. The rule estimates the expected date of delivery (EDD) by adding one year, subtracting three months, and adding seven days to the first day of a woman's last menstrual period (LMP).  
If a woman's LMP was on April 16, 2014, when is her EDD? (Month, Day, Year)  
How many days is that?
2. Your hospice patient is on a double pump. One side is running NS at 30 mL/hr KVO, and the other has a 100 mL bag containing 2 mg morphine sulfate (MS) running at 5 mL/hr for pain management. She begins to show signs of breakthrough pain and her doctor orders 0.2 mg MS STAT. You would normally use a prefilled syringe containing 1 mg/1 mL MS and give 0.2 mL IV push, but on looking in the narcotic cabinet you find none available and the pharmacy is closed. It occurs to you that you could reset the pump to deliver 0.2 mg MS in 5 minutes, then go back to 5 mL/hr. At what rate should you set the pump?
3. Now that you know the rate, from problem #2, what is the volume to be infused?
4. You are shadowing a nurse during a clinical who receives an order to adjust the infusion rate of a pump so that 1.6 mg of lidocaine are being delivered per minute. Hanging is a 100 mL piggyback containing 0.4 grams lidocaine, a 0.4% solution. At what rate will you set the infusion?
5. You are to prepare 2 L of 3% sodium hypochlorite (bleach) and water solution? You have only a measuring cup. How much of each do you need? Give answer in cups. Give fractional part of answer as a fraction and not a decimal.
6. Tagamet is ordered 200 mg, IV, q6h. Available is Tagamet 300 mg in a 2 mL vial of aqueous solution. You are to dilute a portion of this in 100 mL NS and infuse over 20 minutes using a Buretrol with a drop factor of 12 gtt/mL. How much Tagamet will you inject into the Buretrol, and what will the drip rate be?
7. How much water would you add to prepare 500 mL of a 1:35 bleach solution from a 1:10 bleach solution?

8. Cefaclor, from the label below, is prescribed to a child that weighs 49 ½ pounds. How many milliliters should be administered for each dose per day? (Usual dose, not otitis media) Round to nearest tenth.

100 mL CECLOR® CEFACLOR FOR ORAL SUSPENSION, USP  
**187 mg per 5 mL.** Overize bottle provides extra space for shaking. Store in a refrigerator. May be kept for 14 days without significant loss of potency. Keep tightly closed. Discard unused portion after 14 days.  
**SHAKE WELL BEFORE USING.**  
 Control No.

Usual Dose—Children, 20 mg per kg a day (40 mg per kg in otitis media) in two divided doses. Adults, 375 mg two times a day. See literature for complete dosage information.  
 Contains Cefaclor Monohydrate equivalent to 3.74 g Cefaclor in a dry pleasantly flavored mixture.  
 Prior to Mixing, Store at Controlled Room Temperature 59° to 86°F (15° to 30°C)  
 Directions for Mixing—Add 62 mL of water in two portions to the dry mixture in the bottle. Shake well after each addition.  
 Each 5 mL (Approx. one teaspoonful) will then contain: Cefaclor Monohydrate equivalent to 187 mg Cefaclor.  
 WV 6502 AMX  
 Mfd. by Eli Lilly Industries, Inc., Carolina, Puerto Rico 00985  
 a subsidiary of Eli Lilly & Co., Indianapolis, IN, U.S.A.  
 Expiration Date

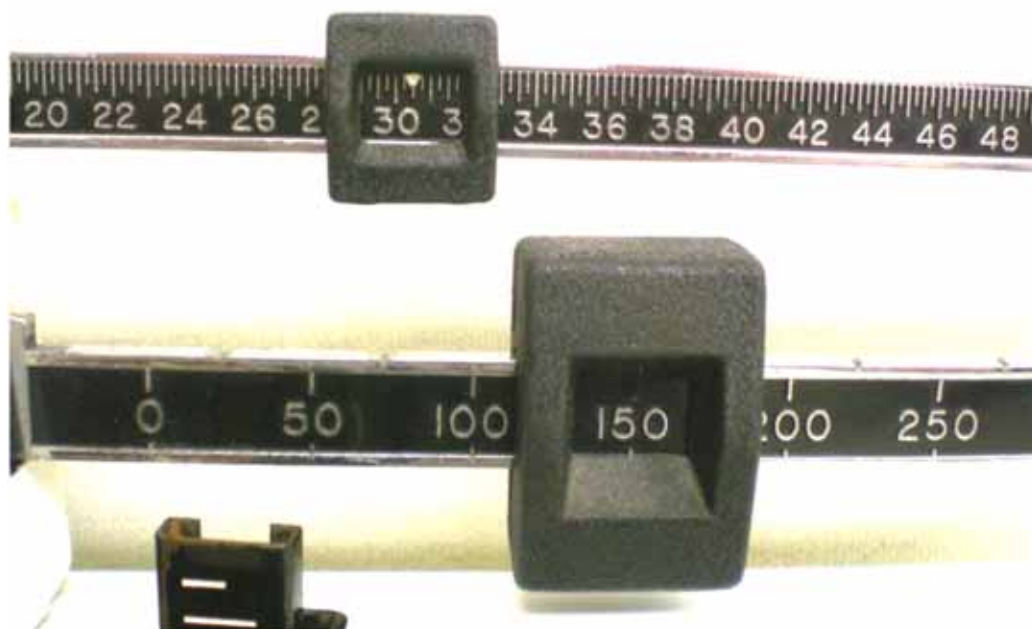
NDC 0002-5130-48  
 100 mL (When Mixed) M-5130

**CECLOR®**  
**CEFACLOR**  
**FOR ORAL**  
**SUSPENSION, USP**  
**187 mg**  
**per 5 mL**  
 CAUTION—Federal (U.S.A.) law prohibits dispensing without prescription.

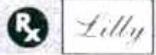
9 87-3015-2000 6  
 PULL

9. A doctor's order is to infuse dopamine at 3 mcg/kg/min. You are able to locate a premixed IV bag containing 800 mg dopamine in 250 mL normal saline. The patient weighs 154 pounds. What is the rate (mL/hr) at which you should set the IV pump? Round to nearest tenth.
10. How many grams of a 5% sulfur ointment must be mixed with 180 grams of a 20% sulfur ointment to prepare an 8% sulfur ointment?
11. Four nurses, Amy, Bill, Cathy, and Doris take turns cleaning the break room every weekday. A different person cleans each day, and the nurses repeat the same cleaning order. If Cathy will be cleaning this Thursday, how many weeks will pass before she cleans again on Thursday?

12. Below is a standard balance beam weight scale. The weight indicated on this scale is in pounds. What is the weight in kilograms? Round to the nearest tenth.



13. A nurse adds 1.6mL of diluent to this vial of powdered penicillin G. How many mL will you give the patient to provide a dose of 200,000 U? Round to nearest tenth mL.

<p>CAUTION—Federal (U.S.A.) law prohibits dispensing without prescription.</p> <p>Sterile solution may be kept in refrigerator for 7 days without significant loss of potency.</p>		<p>NDC 0002-1406-01 VIAL No. 526</p> <p></p> <p><b>PENICILLIN G POTASSIUM FOR INFECTION USP</b> (BUFFERED)</p> <p><b>1,000,000 Units</b></p>	<p>Exp. Date/Control No.</p>								
<p>Usual Adult Dose—Intramuscularly, 400,000 units 4 times a day. Intravenously 10,000,000 units a day. See literature. Contains sodium citrate-citric acid buffer.</p>	<table border="0"> <tr> <td>Add diluent</td> <td>Cont of Solution</td> </tr> <tr> <td>9.6 ml</td> <td>100,000 Units/ml</td> </tr> <tr> <td>4.6 ml</td> <td>200,000 Units/ml</td> </tr> <tr> <td>1.6 ml</td> <td>300,000 Units/ml</td> </tr> </table>	Add diluent	Cont of Solution	9.6 ml	100,000 Units/ml	4.6 ml	200,000 Units/ml	1.6 ml	300,000 Units/ml		
Add diluent	Cont of Solution										
9.6 ml	100,000 Units/ml										
4.6 ml	200,000 Units/ml										
1.6 ml	300,000 Units/ml										
<p>VA 325 AMX Eli Lilly &amp; Co., Indianapolis, IN 46205, U. S. A.</p>											

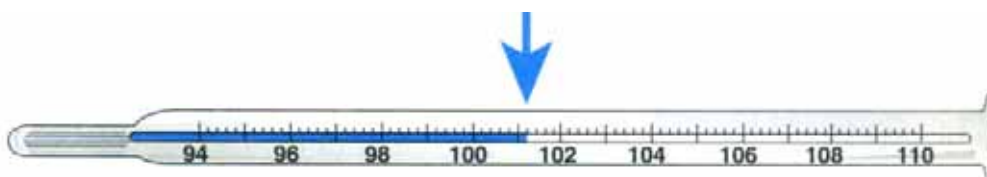
14. How many 0.0125 grain doses can be made from a  $\frac{3}{8}$  grain of a drug?

15. Listed below are the ratios of solute to solvent. Which ratio represents a solution which is 40% solute?

- A. 2:3    B. 1:2    C. 3:8    D. 4:10    E. 2:15

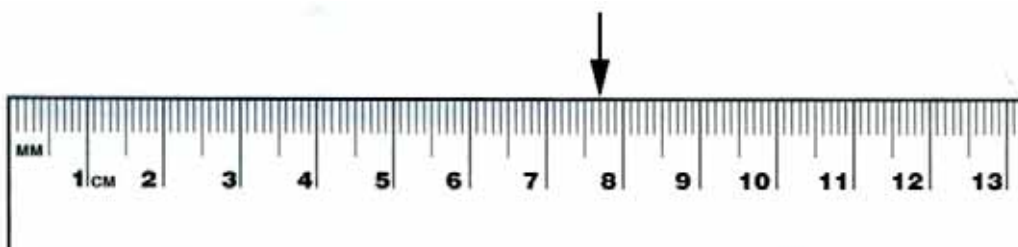
16. One gram of dextrose provides 3.4 calories. How many calories would be provided by a liter of a 50% dextrose solution?

17. A patient's temperature is shown in °F. What is this temperature *in Celsius*? (round to the nearest tenth)

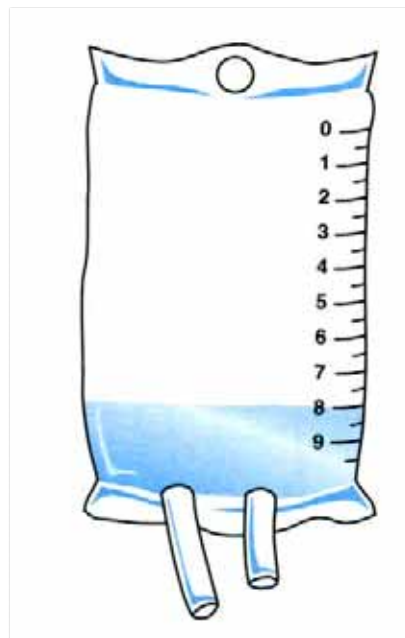


18. How many grams of solute are needed to prepare 2 oz of 8% iodine solution?

19. What is the measurement indicated at the arrow? Give answer in centimeters.



20. The 1-liter IV bag at the right indicates how much D5W is remaining?



21. Phenobarbital  $180 \text{ mg/m}^2/24 \text{ hours}$  given every eight hours is ordered for a child whose BSA (body surface area) is  $0.29 \text{ m}^2$ . How much will each dose be? Round to nearest tenth.

22. You evaluate a patient's intake and output for 8 hours.

Intake for 8 hours:

- 3 x 8-oz cups of coffee
- 4 oz orange juice
- $3/4$  cup of milk
- 8 oz tomato soup
- $1/2$  cup Jello
- 2 cups of water
- 750 mL of 0.9% normal saline IV

How many milliliters should you record as intake?

23. Levothyroxine (Synthroid)  $150 \mu\text{g}$  PO per day is ordered for a patient with hypothyroidism. It is supplied as  $0.075 \text{ mg}$  tablets. How many tablets should the patient take daily? A safe dose of Synthroid is  $1.5 \mu\text{g/kg/day}$ . The patient weighs 196 pounds. Is the dose safe?

24. A homebound patient must take 400,000 units of nystatin PO every 4 hours, to swish in the mouth and then swallow. It is available as 100,000 units/5 mL. The patient has only household teaspoons. How many teaspoons should the patient be instructed to take?
25. A safe maintenance dose of aminophylline is 0.36 mg/kg/hour. It is supplied as 100 mg/100 mL. Your patient is 130 pounds and is receiving 20 mL/hour. Is the dose safe?
26. A patient returns to the doctor's office for more follow-up treatments. A therapist provides the following treatments/services: 3 heat pack treatments at \$41.22 each, 2 whirlpool treatments at a cost of \$54.72 each, 6 traction treatments at \$38.95 each, 5 massage treatments for ½ hour each at a cost of \$70.00 per hour, and 2 sessions of ROM (range-of-motion) exercises at \$71.20 each. The insurance pays 65% of the current charges and the patient pays \$320.00 with a check. If the patient had a previous balance of \$288.91, what is her current balance now?

27. Doctor's order is for:  
Atropine 0.7 mg  
How much will you give?



28. The doctor orders: calcium gluconate 0.93 mEq  
How much will you give?

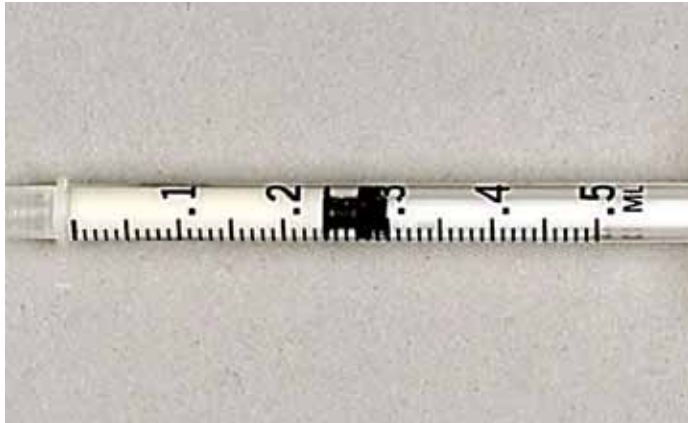




**The doctor's order is for 250 mL of 1/4S to infuse at 12 gtt/min.  
Set calibration is 12 gtt/mL. Start time is 1355.**

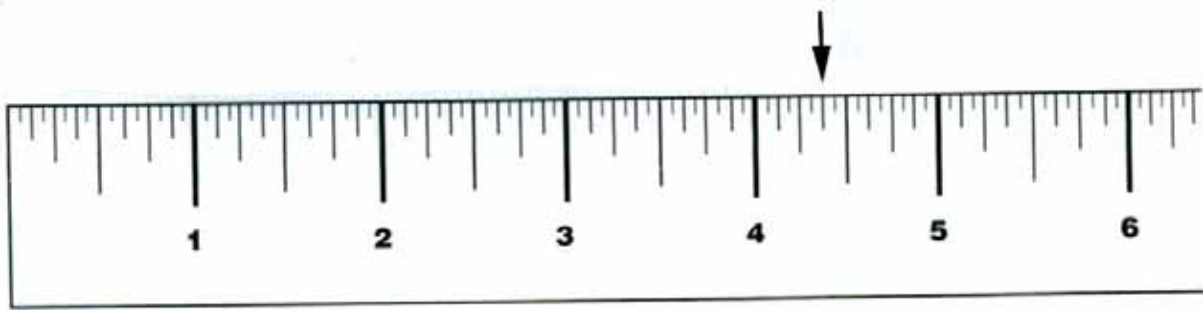
29. What is the infusion time for this IV order?
30. What is the completion time for this IV order?
31.  $16\frac{2}{3}\%$  of 138 = \_\_\_\_\_
32. What percent of 32 is 12?
33. 18.75% of \_\_\_\_\_ = 13.5
34. 125 mcg = \_\_\_\_\_ mg
35. The recommended dose of meperidine (Demerol) is 6 mg/kg/24 hr for pain, in divided doses every four to six hours, as necessary. Demerol is available in ampules or cartridges labeled 50 mg/mL. How much Demerol would be appropriate for a 33-pound child as a single dose every six hours?
36. You are asked to make 4 ounces of a 50% solution of Isopropyl Alcohol. On hand is a bottle of 70% Isopropyl Alcohol and purified water. How many milliliters of each will you need? Round each to the nearest whole milliliter.
37. A pharmacist is asked to mark up a certain medication from \$3.75 to \$7.95. What is the percent markup?
38. A serum dilution is made using a 1-to-6 ratio of serum to diluents. The glucose concentration of the diluted specimen was found to be 140 mg/dL. What glucose value should be reported for the serum?
39. You have dopamine prescribed at 6 mcg/kg/min. The patient weighs 198 pounds. The concentration of the dopamine is 800 mg/500 mL. What is the desired dose of dopamine in mL/hr? Round to the nearest hundredth.

40. What is the amount shown on this 0.5 mL syringe?



41. A patient's symptoms first appeared exactly 4 hours 38 minutes ago. If it is exactly 4:04 PM right now, at what time did the symptoms first appear?
42. A patient is 5' 9 1/2 " tall. How much is that in centimeters? Round to nearest tenth.
43. The cost of supplies and maintenance for a medical bed must be less than \$500 per year. If the supplies cost is triple the maintenance cost, how much can be spent on supplies?
44. The guide for calculating baseline fluid need is: Multiply body weight in kg times 30 mL. For a 105-pound patient, what is the baseline fluid need in cups?
45. The available strength of a drug is 2 g in 2.6 mL. A dosage of 600 mg has been ordered. How many milliliters will you give? Round to nearest tenth.

46. What is the measurement indicated at the arrow on this inch-ruler?



47. You are to give Lidocaine 30 mcg/kg/min to a child weighing 55 lb. The piggyback contains 120 mg Lidocaine in 100 mL NS. At what rate will you set the pump?

**The order is for 2 g of lidocaine in 500 mL of NS to infuse at 2-4 mg/min.**

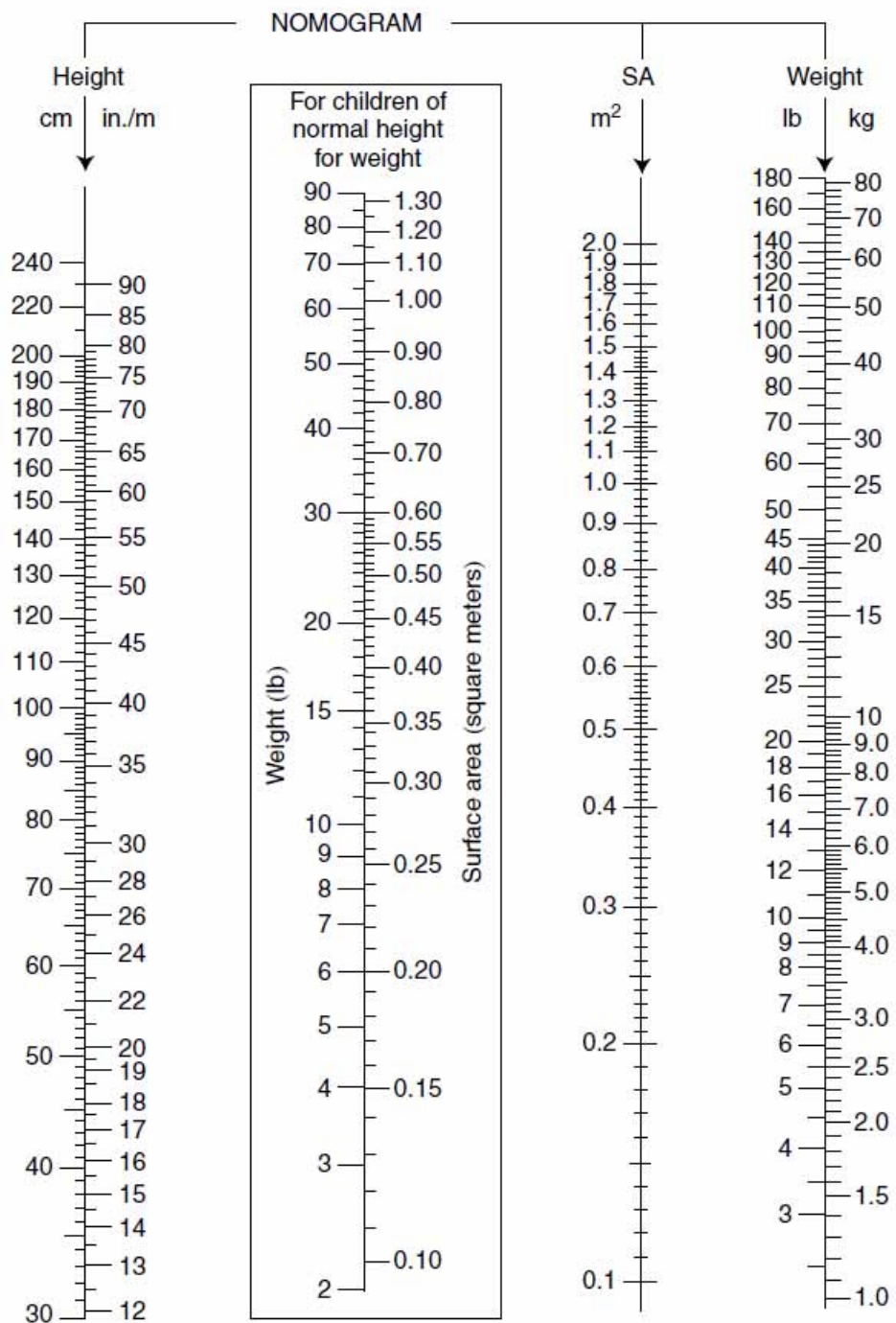
48. Calculate the flow rate range in mL/h to the nearest whole mL.

49. The patient stabilizes at 45 mL/h. Calculate the dosage infusion rate at which the patient stabilized in mg/min.

50. Using the nomogram on page 11, find the body surface area for an adult who weighs 36 kg and is 106 cm tall.

**Tie-breaker.** Using the chart on page 12, find the length-for-age percentile for a 17-month old boy who is 77 cm tall.

## West Nomogram-Body Surface Area

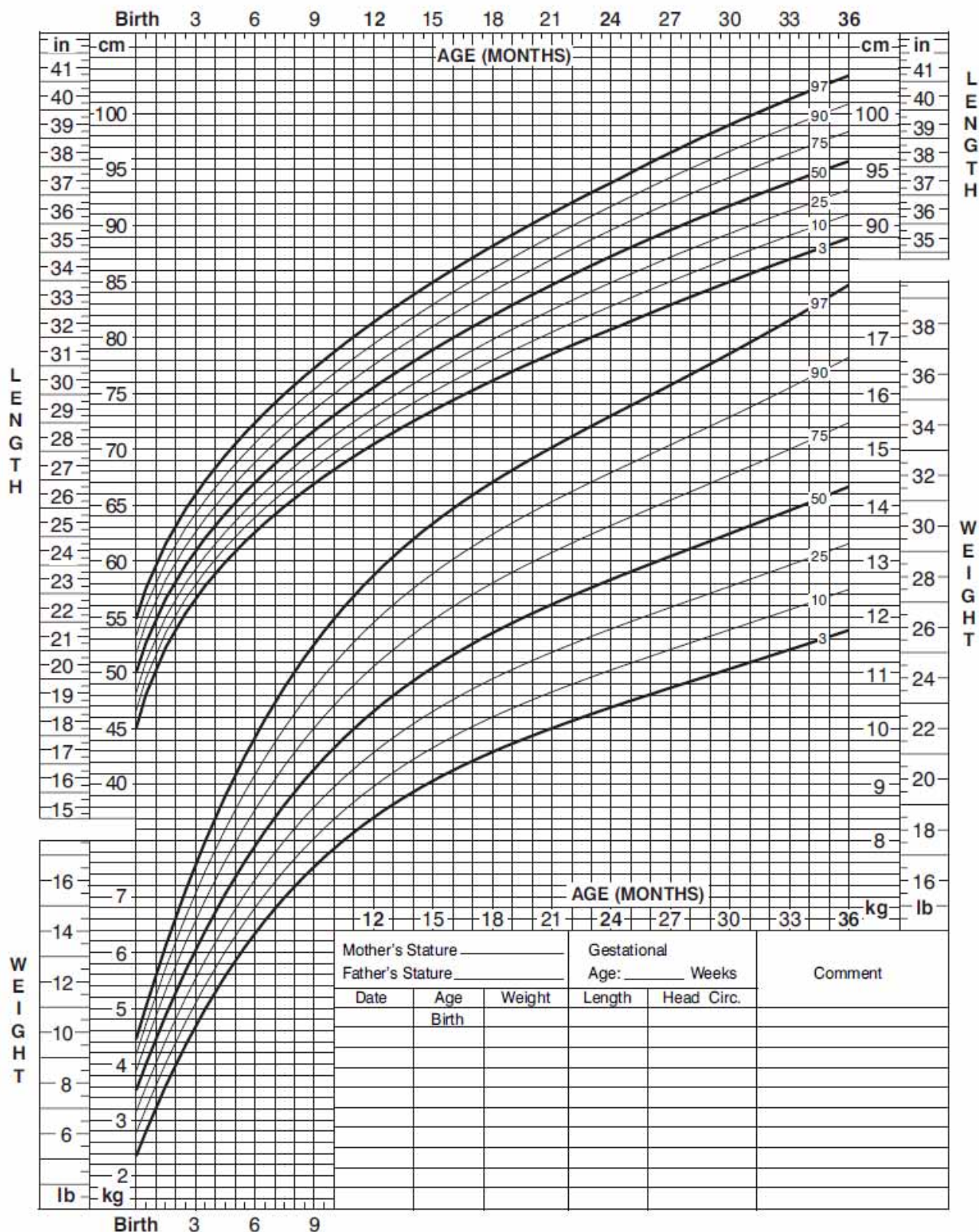


Note: Nomogram modified from data of E. Boyd by C.D. West; from Behrman, R.E., Kliegman, R.M., & Jenson, H.B. (eds.). (2000). *Nelson textbook of pediatrics* (16th ed.). Philadelphia: W.B. Saunders.

**Birth to 36 months: Boys**  
**Length-for-age and Weight-for-age percentiles**

NAME \_\_\_\_\_

RECORD # \_\_\_\_\_



Published May 30, 2000 (modified 4/20/01).  
 SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).  
<http://www.cdc.gov/growthcharts>

