

LOS ANGELES VALLEY COLLEGE
HEALTH SCIENCE DEPARTMENT
NURSING PROGRAM
NS 112 CARE OF CHILDREN AND FAMILY
PEDIATRIC MATH WORKBOOK

INSTRUCTOR:

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OVERVIEW: Prior to the administration of a pediatric drug, it is necessary to determine if an ordered dose of medication is reasonable based on the body weight of the child and the drug manufacturer's recommended dose. This is known as determining a reasonable pediatric dose. The following math calculations will guide you through the most common situations in which the nurse must administer medication to a child.

ROUNDING INSTRUCTIONS: If the answer is less than 1.0, round off to the nearest hundredth (example: $0.758 = 0.76$). If the answer is more than 1.0, round off to the nearest tenth (example: $1.89 = 1.9$). Heparin and Insulin are not rounded off as the specially designed syringe that is used to administer these medications is calibrated for very small and extremely specific doses thus negating the need to round off the answer.

Sample Problems:

1. $0.345 = \underline{\hspace{2cm}}$ (Answer: 0.35)
2. $0.629 = \underline{\hspace{2cm}}$ (Answer: 0.63)
3. $1.533 = \underline{\hspace{2cm}}$ (Answer: 1.533 or 1.53)
4. $3.645 = \underline{\hspace{2cm}}$ (Answer: 3.65)

GENERAL PRINCIPLE: Most pediatric math calculations will require the child's weight. This is usually recorded in kilograms.

$$2.2 \text{ pounds (lbs)} = 1 \text{ kilogram (kgs)}$$

Sample Problems:

1. An infant weighs 11 pounds or kilograms (Answer: 5.0 kilograms)
2. A child weighs 33 pounds or kilograms (Answer: 15.0 kilograms)
3. An infant weighs 2000 grams or kilograms (Answer: 2 kilograms)
4. An infant weighs 9 kilograms or pounds (Answer 19.8 pounds)
5. A child weighs 23 kilograms or pounds (Answer: 50.6 pounds)
6. An infant weighs 3000 grams or pounds (Answer: 6.6 pounds)

CALORIE CALCULATIONS: In order to calculate a pediatric client's caloric needs, the following table should be used:

High risk neonate:	120-150 calories/kg/day
Normal neonate:	100-120 calories/kg/day
1-2 years of age:	90-100 calories/kg/day
2-6 years of age:	80-90 calories/kg/day
7-9 years of age:	70-80 calories/kg/day
10-12 years of age:	50-60 calories/kg/day
Then advance to adult values	

Sample Problems:

1. A child weighs 44 lbs and needs 80-90 c/kg/day. Calculate the range of calories that the child requires. c/day. (Answer: 1600-1800 c/day)

2. A infant weighs 4000 gms and needs 100-120 c/kg/day. Calculate the range of calories that the child requires. _____ c/day. (Answer: 400-480 c/day)

FLUID CALCULATIONS: In order to calculate a pediatric client's fluid needs, the following table should be used:

Body Weight (kg)	Amount of Fluid per Day
1-10	100 ml/kg
11-20	1000 ml plus 50 ml/kg for each kg >10 kg
>20	1500 ml plus 20 ml/kg for each kg > 20 kg
At 70 kg or more, advance to adult values.	

Sample Problems:

1. A child weighs 33 pounds. Calculate the child's 24 hour maintenance fluid needs. _____ ml/day. (Answer: 1250 ml/day)
2. A child weighs 23 kg. Calculate the child's 24 hour maintenance fluid needs. _____ ml/day. (Answer: 1560 ml/day)
3. An infant weighs 4 kg. Calculate the infant's 24 hour maintenance fluid needs. _____ ml/day. (Answer: 400 ml/day)
4. An infant weighs 15 pounds. Calculate the infant's 24 hour maintenance fluid needs. _____ ml/day. (Answer: 681.8 or 682 ml/day)

DEHYDRATION CALCULATIONS: In order to calculate a pediatric client's percentage of dehydration, the following table should be used:

Mild Dehydration:	3-5% loss of body weight
Moderate Dehydration:	6-9% loss of body weight
Severe Dehydration:	10% and >10% loss of body weight
This problem may be calculated in pounds or kilograms	

Step 1: Determine the weight loss (subtract the present/sick weight from the last known well weight). This is the weight loss.

Step 2: Divide the weight loss by the well weight.

Step 3: Convert the answer obtained in Step 2 into a percentage by moving the decimal point two places to the right.

Sample Problems:

1. A child weighs 44 lbs. After 24 hours of vomiting and diarrhea, the child weighs 19 kgs. The child is _____% dehydrated. (Answer: 5%)
2. A child weighs 10 kgs. After 24 hours of vomiting and diarrhea, the child weighs 21 lbs. The child is _____% dehydrated. (Answer: 4.5 or 5%)
3. An infant weighs 9000 gms. After 24 hours of vomiting and diarrhea, the infant weighs 18 lbs. The infant is _____% dehydrated. (Answer: 9%)

APOTHECARY CALCULATIONS: In order to calculate a pediatric client's apothecary versus metric system needs, the following table should be used:

1 teaspoon:	5 ml
1 tablespoon:	15 ml
1 ounce:	30 ml
1 grain	60 mg
½ grain	30 mg
¼ grain	15 mg

Sample Problems:

1. A child is to receive 2 teaspoons of medication. This equals _____ ml.
(Answer: 10 ml)
2. A child consumes 5 tablespoons of broth. This equals _____ ml. (Answer: 75 ml)
3. An infant consumes 3 ounces of formula. This equals _____ ml. (Answer: 90 ml)
4. ½ grain of p.o. codeine is ordered for an adolescent following dental surgery. The nurse will administer _____ mg of codeine. (Answer: 30 mg)
5. ¼ grain of p.o. codeine is ordered for a child as a cough suppressant. The nurse will administer _____ mg of codeine. (Answer: 15 mg)

SPLIT DOSAGE/LOADING DOSE CALCULATIONS: In order to calculate a pediatric client's split dosage/loading dose needs, the following steps should be taken:

- Step 1: Determine the total amount of medication to be given. This is usually the weight multiplied by the recommended dosage. Example: 2 kg x 30 mg/kg = 60 mg (total dosage)
the recommended dosage. Example: 2 kg x 30 mg/kg = 60 mg (total dosage)
- Step 2: Calculate the first/loading recommended dose. Example: ½ of the total dosage = 30 mg.
- Step 3: Calculate any additional doses. Example: ¼ (dose #2) and ¼ (dose #3) of the total dose = 15 mg (dose #2) and 15 mg (dose #3).

Sample Problems:

1. An infant weighs 5 kg. The medication is calculated as 20 mg/kg. It is to be given in 3 doses of ½, ¼, and ¼. Total dose = _____ mg. Dose #1 = _____ mg.
Dose #2 = _____ mg. Dose #3 = _____ mg. (Answer: Total dose: 100 mg; Dose #1: 50 mg; Dose #2: 25 mg; Dose #3: 25 mg)
2. A child weighs 44 lbs. The medication is calculated as 10 mg/kg. It is to be given in 3 doses of ½, ¼ and ¼. Total dose = _____ mg. Dose #1 = _____ mg.
Dose #2 = _____ mg. Dose #3 = _____ mg. (Answer: Total dose: 200 mg. Dose #1: 100 mg ; Dose #2: 50 mg; Dose #3: 50 mg)

TAPERED CALCULATIONS: In order to calculate a pediatric client's tapered dose needs, the following steps should be taken:

- Step 1: Determine the correct date and time of the requested dosage.
- Step 2: Then implement the standard formula of desired dose x how the medication is

supplied divided by the dose of hand. (Example: $D/H \times S = \text{correct dose}$).

Sample Problems:

1. A child is to receive Prednisone for 3 days. The dose on Monday is 10 mg. The dose on Tuesday is 15 mg. The dose on Wednesday is 20 mg. Prednisone is available in scored tablets of 20 mg. How many tablets would the nurse administer on Tuesday? _____ tablet. (Answer: 0.75 tablet or $\frac{3}{4}$ of a tablet)
2. A child is to receive Prednisone for 3 days. The dose on Monday is 20 mg. The dose on Tuesday is 30 mg. The dose on Wednesday is 40 mg. Prednisone is available in scored tablets of 20 mg. How many tablets would the nurse administer on Tuesday? _____ tablets. (Answer: 1.5 tablets or $1\frac{1}{2}$ tablets)

SCHEDULE CALCULATIONS: In order to calculate a pediatric client's dose on a schedule, the following steps should be taken:

Step 1: List the number of doses to be given.

Step 2: List the first day that the medication is to be given.

Step 3: List the first time that the medication is to be given.

Step 4: Determine the day and time that the specific dose is to be given.

Sample Problems:

1. Pediatrician orders: 2 gtts OU q 3 hours x 5 doses. Begin at 9:00 am on Monday. What day and time will dose #3 be given? (Answer: Monday at 3:00 pm)
2. Pediatrician orders: 1 gtt OD q 5 hours x 7 doses. Begin at 0800 on Tuesday. What day and time will the last dose be given? (Answer: Wednesday at 1400).

IV CALCULATIONS: In order to calculate a pediatric client's IV drip rate, the following steps should be taken:

Step 1: Utilize the formula of V (volume) x DF (drip factor) divided by T (time)

It is easiest if the volume is expressed in an hourly amount; the drip factor is always expressed as 60 in pediatrics; the time should be expressed in minutes.

Sample Problems:

1. 350 ml of IV fluids are to infuse over 7 hours. Use micro-drip tubing. _____ ml/hr. (Answer: 50 ml/hr)
2. 1000 ml of IV fluids are to infuse over 12 hours. Use mini-drip tubing. _____ gtts/min. (Answer: 83 gtts/min or 83.3 gtts/min)
3. 750 ml of IV fluids over 5 hours. Use 60 drop tubing. _____ gtts/min. (Answer: 150 gtts/min)
4. Ampicillin 250 mg IVPB q 6 hours over 45 minutes. Ampicillin is prepared in 50 ml NS. Use pedi-drip tubing. _____ ml/hr. (Answer: 66.66 ml/hr or 66.7 ml/hr or 67 ml/hr)

LABEL CALCULATIONS: In order to calculate a pediatric client's medication dose from a label, the following steps should be taken:

- Step 1: Calculate the recommended single dose.
 Step 2: Calculate the recommended total daily dose.
 Step 3: Calculate the single dose ordered.
 Step 4: Calculate the total daily dose ordered.
 Step 5: Compare the recommended and the ordered doses. Generally, the ordered dose can be less than the recommended dose; equal to the recommended dose; but, not greater than the recommended dose.

BRISTOL™

NDC 0015-7941-40
100 ml. Bottle

TEGOPEN®
CLOXACILLIN SODIUM
FOR ORAL SOLUTION

EQUIVALENT TO
125 mg.
per 5 ml.
CLOXACILLIN
when reconstituted
according to directions.

CAUTION: Federal law prohibits
dispensing without prescription.

To the Pharmacist: Prepare solution at time of dispensing. Add a total of 63 ml. water to the bottle. For ease in preparation add the water in two portions—shake well after each addition. Bottle then contains 100 ml. of solution; each 5 ml. contains cloxacillin sodium equivalent to 125 mg. cloxacillin. **LIFT HERE**

BRISTOL LABORATORIES
Div. of Bristol-Myers Company
Syracuse, New York 13201

Usual Dosage:
Adults—250 mg. q. 6h.
Children—50 mg./Kg./day in equally divided doses at 6-hour intervals.
READ ACCOMPANYING CIRCULAR

Sample Problems:

- The child weighs 33 pound. _____ kg. (Answer: 15 kg)
- The recommended single dose is _____ mg. (Answer: 187.5 mg or 188 mg)
- The recommended total daily dose is _____ mg. (Answer: 750 mg)
- The pediatrician orders 150 mg q 6 hours. Is the single dose safe? (Answer: Yes. 150 mg is less than 187.5 or 188 mg). Is the total daily dose safe? (Answer: Yes. 600 mg is less than 750 mg).
- The medication is prepared as 125 mg per 5 ml. The pediatrician orders 150 mg per dose. How many ml of the medication will the nurse administer to the child and by what route? _____ ml. _____ route. (Answer: 6 ml; oral)

RECONSTITUTING FORMULAS: In order to calculate a pediatric client's reconstituted formula, the following steps should be taken:

- Step 1: Multiple the desired concentration by the total amount of formula to be administered. Divide this number by the concentration available. This number is known as the solute (the required amount of full strength formula).
- Step 2: Subtract the solute from the total amount of formula to be administered. This number is known as the solvent (the fluid to be added to the solute).

Sample Problems:

1. The solute (the infant formula Similac) is available as a 100% concentration. The pediatrician has ordered that 100ml of this preparation be administered as a 50% concentration. The nurse will dilute the preparation with sterile water. This means that there will be _____ ml of solute and _____ ml of solvent in the final preparation.

(Answer: 50 ml of solute and 50 ml of solvent)

2. The solute (the infant formula Enfamil) is available as a 100% concentration. The pediatrician has ordered that 100 ml of this preparation be administered as a 75% concentration. The nurse will dilute the preparation with sterile water. This means that there will be _____ ml of solute and _____ ml of solvent in the final preparation.

(Answer: 75 ml of solute and 25 ml of solvent)

1/10: KES