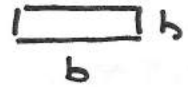
FORMULA SHEET

$\pi = 3.14$

- **AREA of SQUARE**: 

$b \times h$ or l^2
- **AREA of RECTANGLE**: 

$b \times h$
- **AREA of TRIANGLE**: 

$\frac{b \times h}{2}$
- **AREA of circle**: $A = \pi \cdot r^2$ or $A = \pi \cdot r \cdot r$
- **AREA of RECTANGULAR PRISM ("Box")**:
  SUM of AREAS of ALL FACES, OR

  top, bottom: $(b \times h) \times 2$ +
  R, L: $(b \times h) \times 2$
  Front, back: $(b \times h) \times 2$

- **AREA of TRIANGULAR PRISM ("TOBLERONE")**
  AREA of 2 TRIANGLES + AREA of 3 RECTANGLES

  ↓

  $\left(\frac{b \times h}{2}\right) \times 2$ + $(b \times h) \times 3$

  If Triangles are equal — If Rectangles are equal

  or

  $\left(\frac{b \times h}{2}\right) + \left(\frac{b \times h}{2}\right) + (b \times h) + (b \times h) + (b \times h)$

  Triangle 1 — Triangle 2 — Rectangle 1 — Rectangle 2 — Rectangle 3

- **AREA of cylinder**:

  AREA of circular bases + AREA of RECTANGLE

  ↓

  $2 \times \pi r^2$ + Circumference × height

  ↓ ↓

  $2\pi r^2 + d \times \pi \times h$

  $2\pi r^2 + 2r\pi h$ — This only applies if the cylinder has Two circles.

Volume

- General formula: AREA of BASE × height

- Volume of Rectangular prism:

  AREA of RECTANGULAR BASE × height
  ↳ $(b \times h)$ of base × height

  OR

  width × length × height

- Volume of Triangular Prism:

  AREA of Triangular base × height
  ↓
  $\left(\frac{b \times h}{2}\right)$ of base × height

- Volume of cylinder:

  AREA of CIRCULAR BASE × height
  ↓
  $\pi r^2 \times h$

Rule of 3 – Regla de Tres

- If the sale price is 30 $, and this Represents the 70 %, what is the 100% (Regular Price)?

$$\begin{array}{ccc} 30\$ & \xrightarrow{\div} & 70\% \\ x & \times & 100\% \end{array}$$

go across from the x; multiply that number by the one diagonal to it, then divide by the one directly diagonal from x.

$$x = \frac{100\% \times 30\$}{70\%}$$

$$x = \frac{300}{70}$$

You can use this method for many things!

How to study for your Exam.

1. Very important: Breathe! you will do just fine.
2. Review and study this package. Don't do the exercises yet.
3. At the end of each unit:

- Go to "Unit Review"
- Find the "What do I need to know?" section.
Go through this section, and make sure you know all concepts.
- If you find yourself having difficulties with one or more concepts, make sure you focus on doing practice exercises for that concept.
- Once you are satisfied that you know the concepts, try doing a few exercises on the "What should I be able to do?" Section
- then, use the exercises on this booklet to ensure you know everything you need to know.

You'll be able to use cubes, rotation transparencies, reflecting mirror if needed.

Remember: - No electronics allowed
- You can't use your phone as a calculator
- Make sure you bring a calculator and a ruler.

Never give up! Answer each question.
I believe you can... so why can't you?

Mr. Martinez

Perfect Squares

$1 \times 1 = \boxed{1}$
$2 \times 2 = \boxed{4}$
$3 \times 3 = \boxed{9}$
$4 \times 4 = \boxed{16}$
$5 \times 5 = \boxed{25}$

$6 \times 6 = \boxed{36}$
$7 \times 7 = \boxed{49}$
$8 \times 8 = \boxed{64}$
$9 \times 9 = \boxed{81}$
etc

A Perfect square is a number which is a product of another number multiplied by itself

To Square a Number

$2^2 = 2 \times 2$

$4^4 = 4 \times 4 \times 4 \times 4 = 256$

$$\begin{aligned} 3^2 + 4^2 &= (3\times3) + (4\times4) \\ &= 9 + 16 \\ &= 25 \end{aligned}$$

Square Root

$\sqrt{16} = 4$ $\sqrt{100} = 10$ (notice how square roots relate to perfect squares)

To Estimate Square Roots

$\sqrt{15}$

Find the lower and closer perfect square → 9

Find the upper and closer perfect square → 16

Now get their square roots

$\sqrt{9} = 3$ $\sqrt{16} = 4$

so $\sqrt{15}$ is between 3 and 4

Because 15 is closer to 16, $\sqrt{15}$ should be around 3.9

Engineering Maths
First Aid Kit

4.5

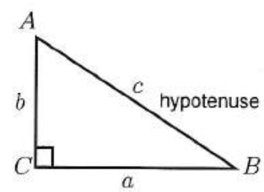
Pythagoras' theorem

Introduction

Pythagoras' theorem relates the lengths of the sides of a right-angled triangle. This leaflet reminds you of the theorem and provides some revision examples and exercises.

1. Pythagoras' theorem

Study the right-angled triangle shown.

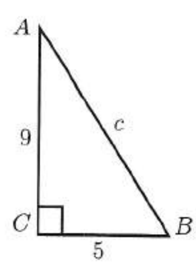


In any right-angled triangle, ABC, the side opposite the right-angle is called the **hypotenuse**. Here we use the convention that the side opposite angle A is labelled a. The side opposite B is labelled b and the side opposite C is labelled c.

Pythagoras' theorem states that the square of the hypotenuse, (c^2), is equal to the sum of the squares of the other two sides, ($a^2 + b^2$).

> Pythagoras' theorem: $c^2 = a^2 + b^2$

Example



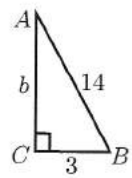
Suppose $AC = 9$cm and $BC = 5$cm as shown. Find the length of the hypotenuse, AB.

Solution
Here, $a = BC = 5$, and $b = AC = 9$. Using the theorem

$$\begin{aligned} c^2 &= a^2 + b^2 \\ &= 5^2 + 9^2 \\ &= 25 + 81 \\ &= 106 \\ c &= \sqrt{106} = 10.30 \qquad \text{(2dp.)} \end{aligned}$$

The hypotenuse has length 10.30cm.

Example
In triangle ABC shown, suppose that the length of the hypotenuse is 14cm and that $a = BC =$ 3cm. Find the length of AC.



Solution
Here $a = BC = 3$, and $c = AB = 14$. Using the theorem

$$\begin{aligned} c^2 &= a^2 + b^2 \\ 14^2 &= 3^2 + b^2 \\ 196 &= 9 + b^2 \\ b^2 &= 196 - 9 \\ &= 187 \\ b &= \sqrt{187} = 13.67 \qquad \text{(2dp.)} \end{aligned}$$

The length of AC is 13.67cm.

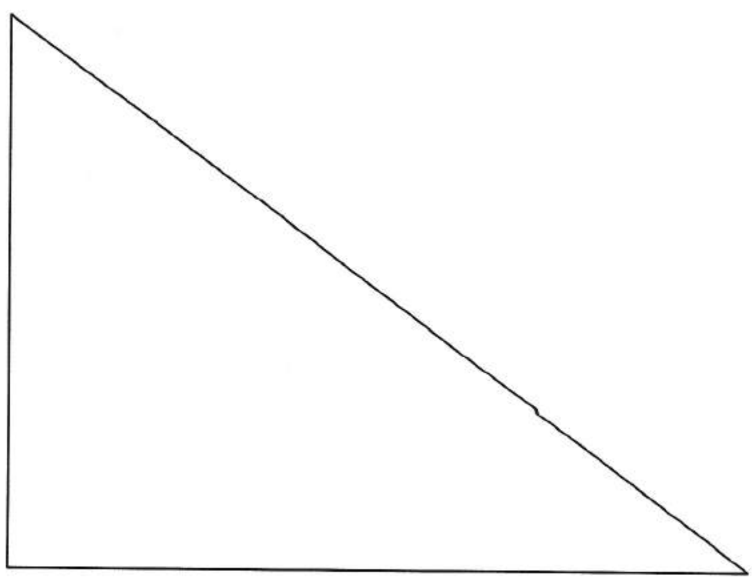
Exercises
1. In triangle ABC in which $C = 90°$, $AB = 25$ cm and $AC = 17$ cm. Find the length BC.
2. In triangle ABC, the angle at B is the right-angle. If $AB = BC = 5$ cm find AC.
3. In triangle CDE the right-angle is E. If $CD = 55$cm and $DE = 37$cm find EC.

Answers
1. 18.33 cm. (2dp.)
2. $AC = \sqrt{50} = 7.07$ cm. (2dp.)
3. $EC = \sqrt{1656} = 40.69$ cm. (2dp.)

Parts of a Right Triangle

Label the right triangle shown below. A word list is included to help you. Some words will be used more than once.

leg
hypotenuse
right angle
side a
side b
side c
vertex
$a^2 + b^2 = c^2$



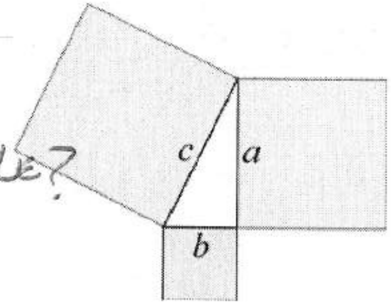
Pythagorean Theorem

____

Right Triangles: The area of side a's square plus side b's square MUST EQUAL THE AREA OF THE HYPOTENUSE'S SQUARE

Pythagorean Triples

WHICH TRIANGLE IS A RIGHT TRIANGLE?



Record the data for the right triangles you discovered. Look for patterns in the data. Describe below any relationships among the parts of the figure.

Length of Leg a (units)	Length of Leg b (units)	Length of Hypotenuse c (units)	Area of square with Length a (square units)	Area of square with Length b (square units)	Area of square with Length c (square units)		Column 6 & 7 Equal?
a	b	c	a^2	b^2	c^2	$a^2 + b^2$	
3	4	5	9	16	25	25	yes
4	5	7					
10	7	12					
6	8	10					
9	15	17					
12	16	20					
8	9	10					

Yes → IT IS A RIGHT TRIANGLE

NO → IT IS NOT A RIGHT TRIANGLE

Kuta Software - Infinite Pre-Algebra

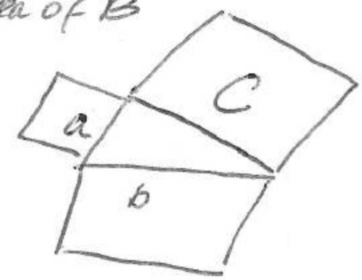
Name____________________

The Pythagorean Theorem

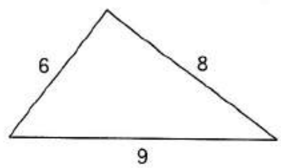
Date____________ Period____

Do the following lengths form a right triangle?

Remember = $a^2 + b^2$ has to be equal to c^2.
OR ⇒ Area of C has to be equal to area of A + Area of B



1)



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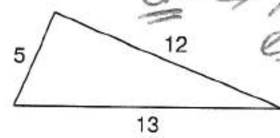

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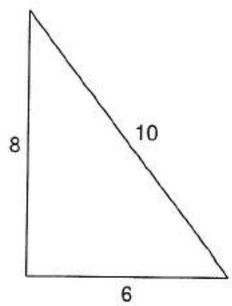

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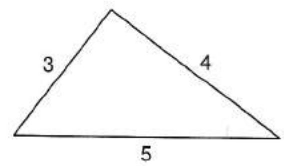
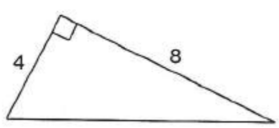


5) $a = 6.4,\ b = 12,\ c = 12.2$

6) $a = 2.1,\ b = 7.2,\ c = 7.5$

Find each missing length to the nearest tenth.

7)



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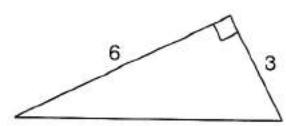

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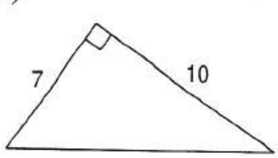
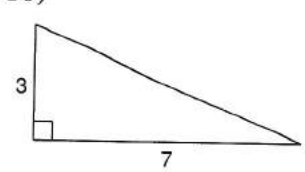
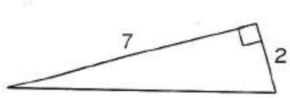


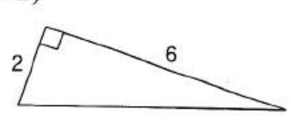
10)



11)



12)



Rates and Ratios

Ratios are comparisons of 2 (or more) similar things.
Ratios can be expressed different ways:
e.g. 3:4 or $\frac{3}{4}$ or 3 to 4

Part to Part ratios :
e.g. Bertha gets 48 out of 50 correct on a test
Ratio of correct to incorrect is 48 : 2 (can be reduced to 24 : 1)

Ratio of incorrect to correct is 2 : 48 (can be reduced to 1 : 24)

Part to Whole ratios :
e.g. Bertha gets 48 out of 50 correct on a test
Ratio of correct to total # of questions on test is 48 : 50 (24 : 25)

e.g. Ovechkin scores 64 of his teams 284 goals (64 : 284)
Reduced would be (16 : 71)

TRY:

From the word " **MISSISSIPPI** " Find:

a) Ratio of vowels to consonants ____________
b) Ratio of consonants to vowels ____________
c) Ratio of vowels to overall letters ____________
d) Ratio of "S"s to other letters ____________
e) Ratio of "M"s and "P"s to vowels ____________
f) Ratio of curved letters to straight letters ____________

From the set of numbers **(4,8,12,14,17,19,22,25,28,30,31)** Find:

a) Ratio of even to odd numbers ____________
b) Ratio of prime #'s to composite #'s ____________
c) Ratio of #'s that are multiples of 4 to other #'s ____________
d) Ratio of prime #'s to overall numbers ____________

Equivalent Ratios :

Are exactly the same concept as equivalent fractions.

e.g. Dave scored 4 of his teams 9 goals. Julia scored 12 of her teams 27 goals. Did they score the same ratio of goals as compared to the teams goals?

Dave	Julia
4 out of 9	12 out of 27
4 : 9 or $\frac{4}{9}$	12 : 27 or $\frac{12}{27}$

Two ways to find out if they are equivalent :

1) Convert to decimals:

$$\frac{4}{9} = 0.444 \qquad \frac{12}{27} = 0.444$$

Both work out to the same decimal therefore they are equivalent ratios.

2) Cross-Multiply :

$$\frac{4}{9} \times \frac{12}{27}$$

$$4 \times 27 = 12 \times 9$$

$$108 = 108$$

These Two Ratios must be the same

TRY:

Convert these Ratios to Decimals to determine if they are equivalent:

a) $\frac{3}{5}$ and $\frac{15}{25}$ b) $\frac{7}{10}$ and $\frac{16}{22}$ c) $\frac{4}{20}$ and $\frac{16}{80}$

d) $\frac{3}{7}$ and $\frac{21}{47}$ e) $\frac{9}{45}$ and $\frac{15}{75}$ f) $\frac{8}{14}$ and $\frac{12}{21}$

Use Cross-Multiplying to see if these Ratios are equivalent:

a) $\frac{4}{6}$ and $\frac{6}{9}$ b) $\frac{9}{12}$ and $\frac{16}{20}$ c) $\frac{30}{80}$ and $\frac{90}{240}$

d) $\frac{55}{77}$ and $\frac{88}{111}$ e) $\frac{35}{50}$ and $\frac{105}{150}$ f) $\frac{66}{100}$ and $\frac{99}{200}$

Finding the Missing Term to Make Equal Proportions :
Sometimes you will be asked to find the missing term to make the ratios equivalent.
e.g. 4 : 7 = 16 : ? Make it look like a fraction

$$\frac{4}{7} = \frac{16}{\square}$$

You can find this missing term a couple of ways:

1) Figure out how you multiplied from numerator to numerator or denominator to denominator and apply it to find answer.

From the example:
from the numerators (4 multiplies by 4 to give you 16)
<u>SO:</u> with the denominators (7 multiplied by 4 gives you 28)
<u>The missing # is 28</u>

2) Replace the missing term with a variable and <u>Cross-Multiply:</u>

From the example:

$$\frac{4}{7} = \frac{16}{n}$$

$$4n = 16 \times 7$$

$$\frac{4n}{4} = \frac{112}{4}$$

$$n = 28$$

Three Term Ratios:

Are exactly the same concept as Two Term ratios. We can make them equivalent and we can compare them to each other in different orders.

e.g. 10 : 5 : 8 = 30 : 15 : 24 (Equivalent)

10: 5 : 8 can be rearranged to 5 : 10 : 8 or 8 : 10 : 5 etc.

Find the equivalent ratios for each of these three term ratios.

a) 8 : 5 : 4 to 24 : ___ : ___ b) 9 : 7 : 5 = 36 : ___ ; ___

c) 6 : 9 : 12 to ___ : 45 : ___ d) 35 : 50 : 60 = ___ : ___ : 180

e) 60 : 15 : 30 = ___ : ___ : 10 f) 40 : 8 : 16 = ___ : 2 : ___

Ratio tables :

Another way of showing ratios by using a table. Ratio must remain the same through the entire table.

e.g. A recipe calls for 7 cups flour to 2 cups sugar :

flour	7	14	21		
sugar	2	4		8	10

Complete these ratio tables:

a)

boys	3	30	60		150	
girls	4			120		240

b)

games	5		15		180	
goals	12	24		120		600

c)

Oiler fans	100		1000		10000	
Flames fans	3	6		60		3000

Rates

A comparison of two amounts measured in different units, e.g. the cost per item or distance as compared to amount of time. The words "per" and "for" are often used.

e.g. Bev can type 400 words in 8 minutes = 400 words per 8 minutes
= 400 words / 8 min

Speed

Is an example of a rate. The amount of distance an object travels over a certain amount of time.

e.g. A train travels 400 km in 5 hrs = 400 km / 5hrs = 80 km / hr

We usually try to have the second unit as ONE.

Unit Rates

A rate for which the second term is ONE.

e.g. Mike runs 10 laps in 5 minutes. This can be rewritten as : 2 laps/min

Answer these questions:

Convert to a Unit Rate:

a) 500 km in 10 hrs. ___________ b) 60 laps in 12 min ___________

c) 800 words in 16 min _________ d) $80 for 5 pizzas _____________

e)$120 for 8 hrs work _________ f) $450 for 15 hrs work __________

Convert to an average speed per unit:

a) A car travels 800 km in 10 hrs ____________________
b) A plane travels 3200km in 5 hrs ___________________
c) A sprinter travels 150 m in 15 seconds ______________
d) A hockey player skates 40 m in 5 seconds ____________
e) A golf ball travels 300m in 6 seconds ______________
f) A turtle travels 20 m in 10 minutes _______________

Math 8 - Year End Review
Percents

Percent means... "out of 100".

Percents are just special types of ratios.

71%

$\frac{71}{100}$

71:100

71 out of 100

Solving % problems.

-Find the % sign first and express it as "something over 100".

-Whatever comes after the word "of" goes on the bottom.

-Whatever is left over, goes on the top.

-Then simply cross –multiply to solve.

Eg.

Ming takes 68 free throw shots at basketball practice. Out of those 68 shots, 17 go in. What is his shooting percentage?

17 is N% of 68.

$$\frac{N}{100} = \frac{17}{68}$$

$$68N = 1700$$

$$\frac{68N}{68} = \frac{1700}{68}$$

$$N = 25$$

Ming's shooting percentage is 25%.

Try these:

1. Your not-so-rich uncle leaves you 30% of all his money. Unfortunately he only has $140. How much money will you inherit from your uncle?

2. You just 25% on your last science test. There were 288 questions on the test (it was out <u>of</u> 288). How many questions did you get correct?

3. 15% of all people are left-handed. If your randomly selected 600 people, how many left-handed people would you expect to find?

Percents Greater than 100%

You cannot get 215% on a test, but a business can have profits go up by 215%. A photo can be enlarged by 400%. An airline can overbook a flight by 150%.

Eg.

A triple-decker banana split has 350% of the daily recommended allowance of fat in your diet. The daily allowance is 40 g. How much fat is in the banana split?

350% of 40 is N.

$$\frac{350}{100} = \frac{N}{40}$$

$$100N = 14000$$

$$\frac{100N}{100} = \frac{14000}{100}$$

$$N = 140 \text{ g}$$

The banana split contains 140 g of fat.

Try:

1. AirMongolia overbooked a flight. They sold 165 tickets, but the plane can only hold 110 passengers. By what % was the flight overbooked?

Fractional and Decimal Percents

Sometimes percents are given as percents or fractions (not whole #s)

Eg. 62.5% or 34 ½%

0.3% of coke is caffeine. A can of coke has 355 ml. How many ml of caffeine can be found in a can of coke?

0.3% of 355 is N

$$\frac{0.3}{100} = \frac{N}{355}$$

$$100N = 106.5$$

$$\frac{100N}{100} = \frac{106.5}{100}$$

N= 1.065 ml

There are 1.065 ml of caffeine in a can of coke.

TRY:

66 players in the NHL are from Russia. There are 1200 players in the whole league. What % of the players are from Russia?

Fractions , Decimals , Percents are basically the same concept.

$\frac{1}{2} = 50\% = 0.5$

$\frac{3}{4} = 75\% = 0.75$

$5/4 = 125\% = 1.25$

Converting fractions to percents

Simply make your fraction equal to "something over 100".

Eg. 2/5

$$\frac{2}{5} = \frac{X}{100}$$

$$5X = 200$$

$$\frac{5X}{5} = \frac{200}{5}$$

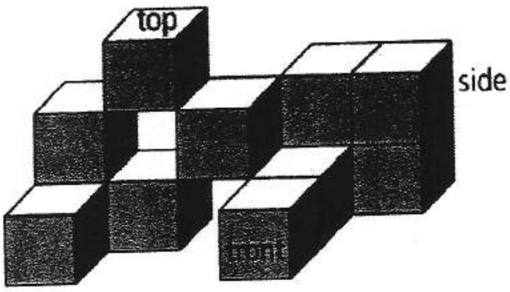
$x = 40$

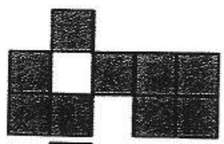
$2/5 = 40\%$

Grade 8 Review 3-D GEOMETRY

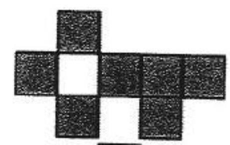
KEY WORDS: •views •nets

1. Which view best represents the front of the 3-D object shown above?



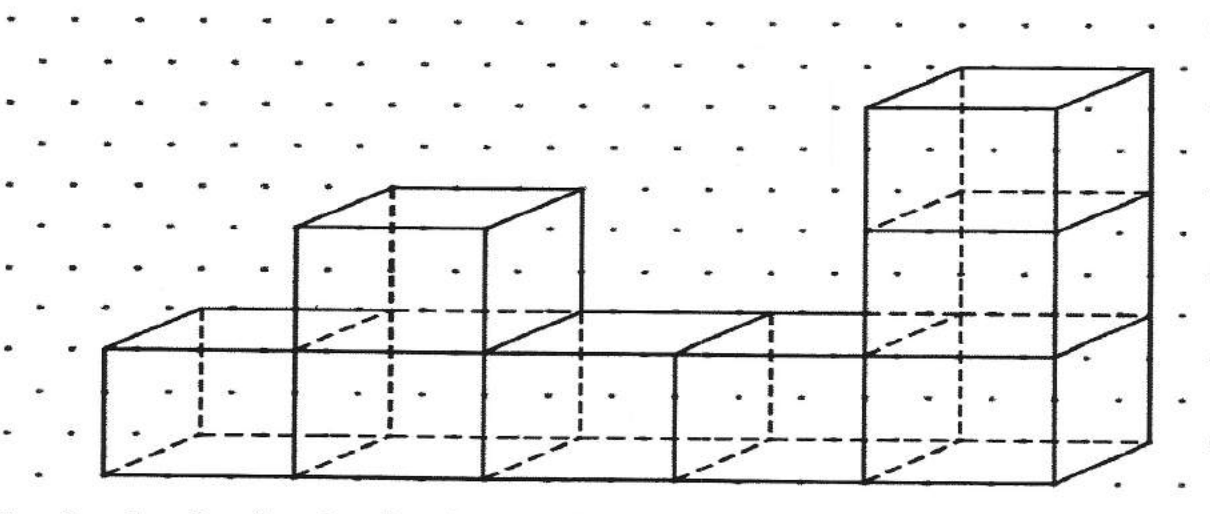
a. 

b. 

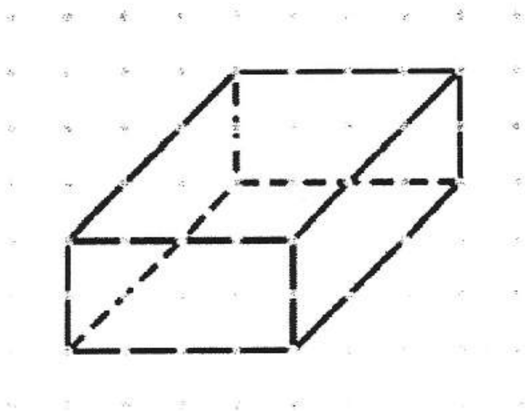
c. 

d. 

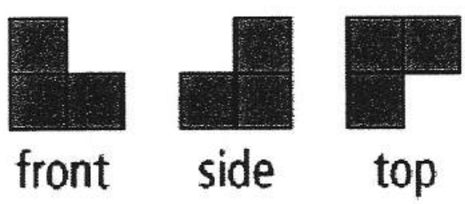
2. Draw the front, top, and side views for the 3-D object shown below.

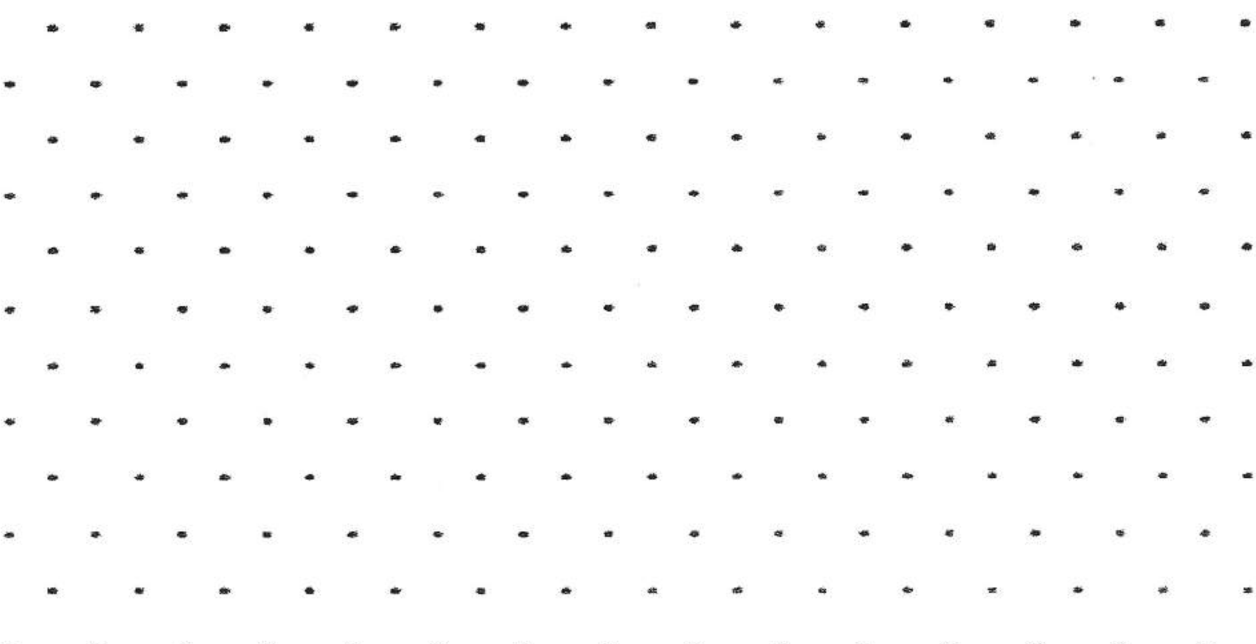


3. Draw a net for the 3-D object shown below.



4. Draw the 3-D object described by the three views shown below.





5. Draw the net for a cylinder with a circumference 62.8 cm and a height of 60 cm. Label the measurements on the net.

6. Draw the 3-D object that would be created by folding the following net.