

119 pts
grade out of 110

MATH 106
EXAM 2

Name

key

Answer all questions with the best possible answer. Point values are indicated. For any drawings mark any right angles and show congruent sides or angles with appropriate markings. Use complete sentences for any explanations. Good luck

Multiple Choice 1 – 12, 2 points each.

1. The scale factor of a baby's head to its body is $\frac{1}{4}$. If the baby is 56 cm long, how long is the baby's head?

- a) 14 cm b) 16 cm c) 4 cm d) 1 cm e) none of these

2. In a photograph of two buildings, Building A is 5 cm tall and Building B is 7 cm tall. In an enlargement of the photograph, Building A is 8 cm tall. What is the scale factor from the original picture to the enlargement?

- a) 3 b) 1.6 c) 0.625 d) 0.875 e) none of these

$$\frac{5}{8} = \frac{7}{x}$$

3. How tall is Building B in the enlargement in the problem above?

- a) 10 cm b) $11 \frac{1}{5}$ cm c) $4 \frac{3}{8}$ cm d) not enough information

4. A triangle is similar to a larger triangle that has lengths 3 times as long as the corresponding lengths in the small triangle. How large is the angle in the smaller triangle that corresponds to the 30° angle in the larger triangle?

- a) 10° b) 30° c) 90° d) 270° e) none of these

5. A circle with center N has an inscribed angle $\angle ABC$ which measures 20° . What does the arc ABC of the circle measure?

- a. 10° b. 20° c. 40° d. 60° e. none of these

6. A circle is divided into six equal sectors. What is the arc length associated with each sector of the circle?

- a. 30° b. 60° c. 90° d. 100° e. none of these

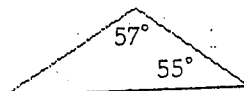
7. Susan is 166 cm tall and in the afternoon she casts a shadow about 55 cm long. Her sister, who is standing next to her, casts a shadow about 35 cm long. About how tall is Susan's sister?

- a. 146 cm b. 105 cm c. 95 cm d. 90 cm e. 12 cm

$$\frac{166}{55} = \frac{x}{35}$$

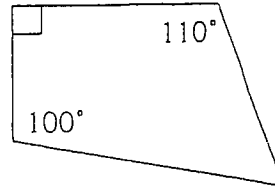
8. Find the measure of the missing angle:

- a. 33°
b. 60°
c. 68°
d. 78°
e. None of these



9. Find the measure of the missing angle:

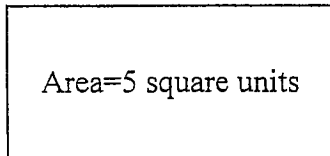
- a. 60°
- b. 100°
- c. 110°
- d. 120°
- e. None of these



10. Which of the following regular polygons will tessellate a plane by itself. Circle all that apply.

- a. Square
- b. pentagon
- c. hexagon
- d. octagon

11. What is the area of a larger rectangle similar to the one shown and with lengths 5 times as long as they are here?



- A. 5 square units
- B. 20 square units
- C. 25 square units
- D. 125 square units
- E. 625 square units

$new\ area = (5)^2 \times 5$

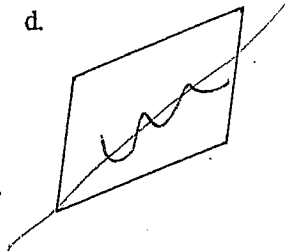
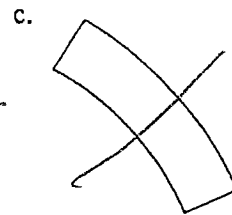
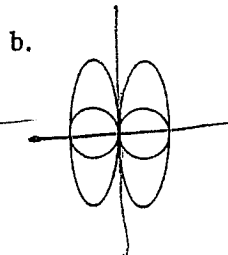
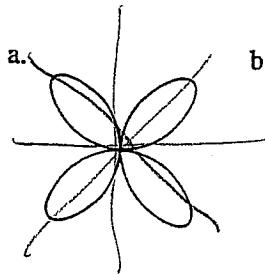
12. Cube A has edges that are 3 times as long as the edges of Cube B. The volume of Cube A is 108 cubic cm. What is the volume of Cube B?

- A. 36 cm³
- B. 324 cm³
- C. 12 cm³
- D. 4 cm³
- E. None of A-D

$108 = 3^3 \times old\ volume$

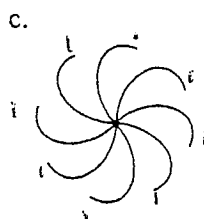
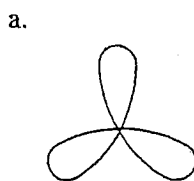
13. (4 points) How many lines of reflection symmetry are there for each of the following?

- a. 4
- b. 2
- c. 1
- d. 0

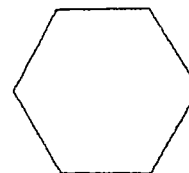


14. (4 points) How many rotational symmetries are there for each of the following?

- a. 3
- b. 2
- c. 8
- d. 6



d. Regular hexagon



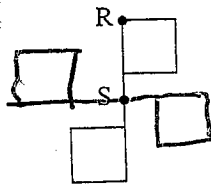
15. (4 points) Complete the following:

- a. Eight feet is $1\frac{1}{3}$ times as long as six feet.
b. Eight feet is $\frac{1}{3}$ times longer than six feet.

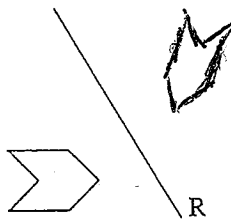
16. (4 points) Circle true or false for each statement. If false, rewrite the statement so that it is true.

- a. True False 6.5 cm is 3.25 times longer than 2 cm.
b. True False A price change from \$14 to \$21 is an increase of 50%.
c. True False A 75° angle is 2.5 times as large as a 30° angle.
d. True False 3.5 is 170% of 1.3.

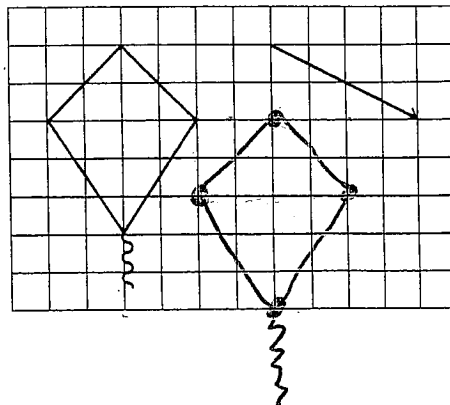
17. (3 points) Draw the image of the figure rotated 90° clockwise around point S.



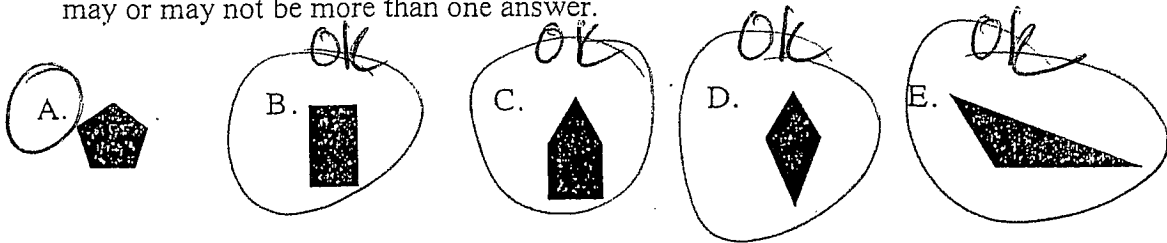
18. (3 points) Draw the reflection of the figure across line R.



19. (3 points) Here is a figure and a mapping vector. Draw the image after the mapping (the image may not be entirely on the grid paper).



20. (5 points) Which of the following figures will *not* tessellate a plane by itself. There may or may not be more than one answer.



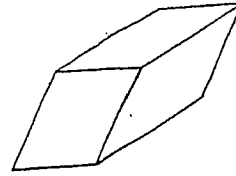
21. (7 points) Determine if the following will tessellate in 3-D space.

- a. soup can
- b. box of crackers
- c. tennis balls
- d. ice cream cone

YES NO
 YES NO
 YES NO
 YES NO

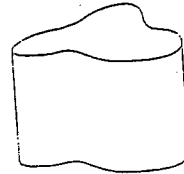
e. This shape

YES NO



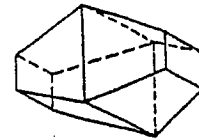
f. This shape

YES NO



g. This shape

YES NO



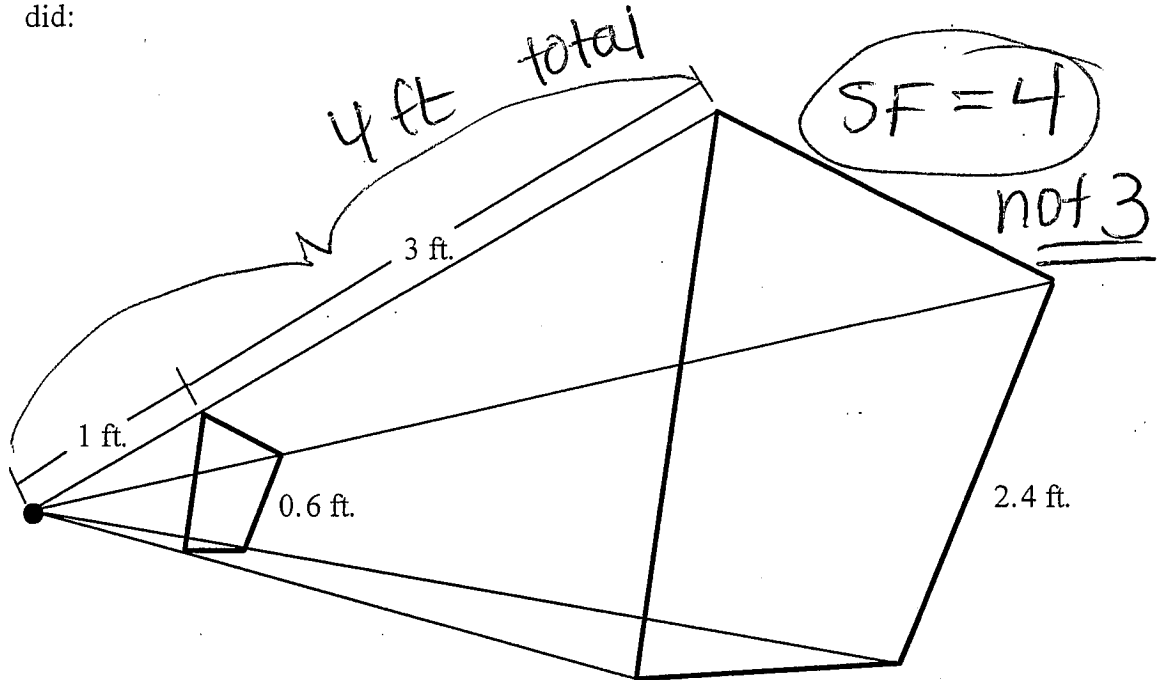
22. (5 points) Explain, using an argument involving measures of angles, why a regular dodecagon (12-gon) will not tessellate by itself, but will form a semi-regular tessellation with equilateral triangles.

A regular dodecagon has angles which measure $(180)(10) = 150^\circ$

By itself $150 + 150 = 300$ (too small)
 $300 + 150 = 450$ (too big to make 360°)

But 2 dodecagons plus 1 ^{triangle} ~~square~~
 $= 150 + 150 + 60 = 360^\circ$

23. (6 points) Frederick drew a quadrilateral on the chalkboard. He then wanted to draw a new quadrilateral similar to the original one, with a scale factor of 3. This is what he did:



When he was done, Frederick was confused because the new quadrilateral did not appear to be "three times as large" as the original.

- a. Why did Frederick draw the picture the way he did?

He extended each line by a factor of 3, not making the total length a factor of 3.

- b. What (if anything) should Frederick have done differently, and WHY?

Frederick should have measured all lines starting at center

24. (4 points) Two regular pentagonal pyramids have the following dimensions:

	Length of Base Edge	Length of Lateral Edge
Pyramid A:	7 cm	10 cm
Pyramid B:	4 cm	7 cm

Are the two pyramids (mathematically) similar? Explain using complete sentences.

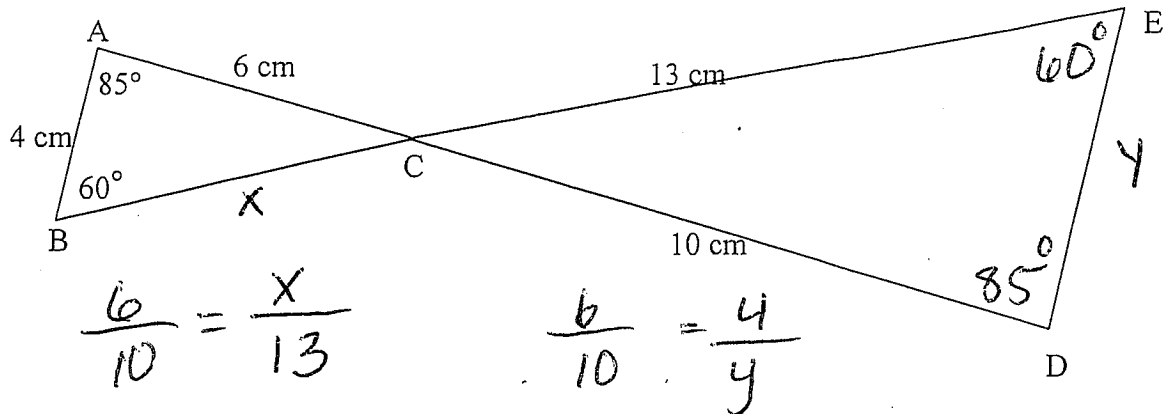
$$\frac{10}{7} = 1.4$$

$$\frac{7}{4} = 1.75$$

not similar

, no scale factor to relate all corresponding sides

25. (8 points) Triangle ABC is similar to triangle DEC. If you know that AC=6 cm, AB=4 cm, DC=10 cm, and CE=13 cm, find the lengths of the other segments and the measures of the angles not given:



$$\frac{6}{10} = \frac{x}{13} \qquad \frac{6}{10} = \frac{4}{y}$$

BC = 7.8

DE = 6.7

measure of angle BCA = 35°

measure of angle ECD = 35°

measure of angle D = 85°

measure of angle E = 60°

26. (4 points) Answer the following:

- a. Give the dimensions of a right square prism that would be similar to one with dimensions of 15cm, 15cm, and 21 cm.

ie. 5, 5, 7 or 30, 30, 42

- b. What was the scale factor you used?

SF = 1/3 or SF = 2

27. (3 points) Cube A has edges that are 3 times as long as the edges of Cube B. The volume of Cube A is 108 cubic cm. What is the volume of Cube B?

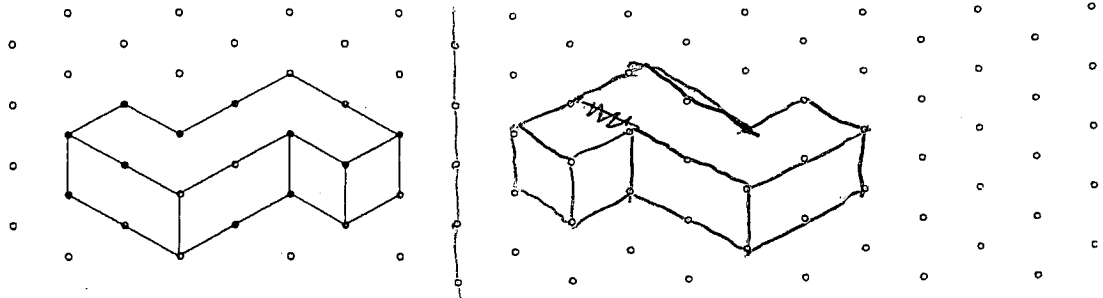
$$108 = 3^3 \times B \qquad B = 4$$

28. (3 points) The area of a triangular metal chime is 38.5 m². A smaller version is to be constructed with a scale factor of 1/4. What is the area of the new triangular chime?

$$38.5 \left(\frac{1}{4}\right)^2 = \text{new area}$$

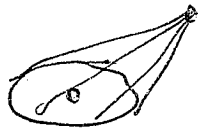
$$2.4 = \text{new area}$$

29. (3 points) Draw a shape that is congruent to the one shown using a reflection symmetry.

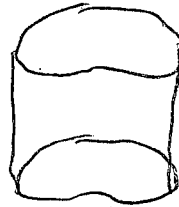


30. (4 points) Draw as carefully as possible the following figures:

a. A circular cone that is not right



b. A right cylinder with a base that is not circular



31. (4 points) Decide if each of the following is always true, sometimes true, or never true.

a) a great circle of a sphere has the same radius as the sphere itself: A

b) a chord of a circle is a diameter of a circle: S

c) a circular cone has reflection symmetry: A

d) a right cylinder is circular: S

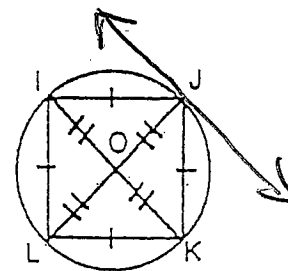
32. (8 points) Using the diagram shown, find each of the following. Use correct notation.

a) a chord of circle O: IJ, IL, LK, KJ

b) a radius of circle O: OI, OJ, OK, OL

c) a major arc of circle O: ~~IL~~

d) Draw in a tangent line to the circle at J.



see picture