# INTEGRATED MATH III SUMMER PACKET
DUE THE FIRST DAY OF SCHOOL

The problems in this packet are designed to help you review topics from previous mathematics courses that are essential to your success in Integrated Math IV. **You are expected to bring this completed packet to class on the first day of school.** In addition, this packet will count as part of your first quarter grade. **Upon returning, you will be ASSESSED on the content of this packet**. All contents outlined in the packet are Integrated Math III objectives. Neatly **SHOW YOUR WORK** on a separate sheet of paper.

1. In $\triangle ABC$, $AB = 3x - 2$, $BC = x + 4$, and $AC = 7$. Also $\overline{AB} \cong \overline{BC}$. Which term does NOT describe $\triangle ABC$?
   a. Equilateral   b.   Acute c. Isosceles d. Obtuse

2. Suppose Hannah wants to construct a square using a compass and a straightedge. Which of the following basic constructions will she need to be able to perform to draw the square?
   a.   angle bisector   c.   acute angles
   b.   obtuse angles   d.   right angles

   **In the figure below,** $\triangle ABC \sim \triangle A'B'C'$.
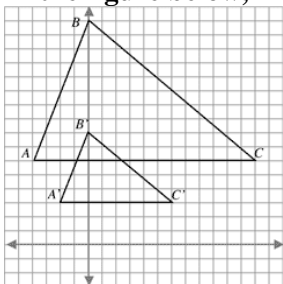
3. Which statement is true of the transformation from $\triangle ABC$ to $\triangle A'B'C'$.?
   a.   The measures of all corresponding angles change by a scale factor of 2.
   b.   The measures of all corresponding angles change by a scale factor of $\frac{1}{2}$.
   c.   The lengths of all corresponding sides change by a scale factor of 2.
   d.   The lengths of all corresponding sides change by a scale factor of $\frac{1}{2}$.

4. A person facing east walks east 20 paces, turns, walks north 10 paces, turns, walks west 25 paces, turns, walks south 10 paces, turns, walks east 15 paces, and then stops. What one transformation could have produced the same final result in terms of the position of the person and the direction the person faces?

5. Which best describes the relationship between the line that passes through (7, 1) and (10, 5) and the line that passes through (–8, 5) and (–5, 9)?
   a.   same line
   b.   perpendicular
   c.   neither perpendicular nor parallel
   d.   parallel

6. A line L_1 has slope $\frac{4}{9}$. The line that passes through which of the following pairs of points is parallel to L_1?
   a. (6, –3) and (2, 6)   c.   (–5, 2) and (6, 6)
   b. (12, –1) and (2, 8)   d.   (–3, 2) and (6, 6)

   Find the sum or difference.
7. $\left(5h^3 + 8h - 9\right) - \left(6h^3 + 6h - 4\right)$

   Find the product.
8. $(u + 4)\left(u^2 - 3u + 3\right)$

9. A rectangle has a length of $x - 6$ and a width of $x - 7$. Which equation below describes the perimeter, P, of the rectangle in terms of x?
   a. $P = 2x - 13$ c. $P = x^2 - 13x + 42$
   b. $P = 4x - 26$ d. $P = x - 13$

10. Only one of the box-and-whisker plots correctly displays data about the ages of team members on a company baseball team. The statements below are all true about the team. Use the statements below to correctly draw the box-and-whisker plot.
   -The youngest member is 20 years old.
   -About 75% of the members are between 25 and 34 years old.
   -No one is older than 34 years old.
   -About 50% of the members are at least 29 years old.

11. What is the surface area of the right cylinder shown below?

5 ft

4 ft
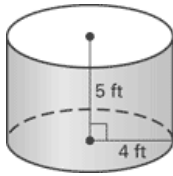
12. The volume of a cube is 125 cubic inches. What is the surface area of the cube?

13. The surface area of a sphere with a radius of 3 meters is 36π square meters. What would the surface area be after the radius is doubled?
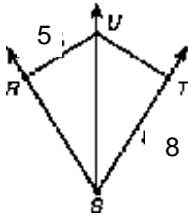
Graph.

14. $y = x^2 + 3$

Complete each statement.

15. Given: $\triangle LMN \cong \triangle UVW$. Complete the statements.
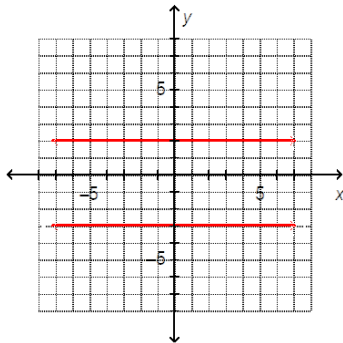
 a. $\overline{UW} \cong$

 b. $\angle LMN \cong$

16. $\overleftrightarrow{SU}$ is the bisector of $\square RST$.

 $\overline{UR} \perp \overline{RS}$

 $\overline{UT} \perp \overline{ST}$

 Complete with a number: $RS = \underline{\hspace{1cm}}$, $UT = \underline{\hspace{1cm}}$.
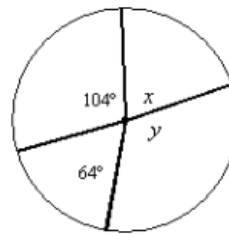

5

U

R

T

8

S

17. Using the distance formula, find the distance between the two parallel lines.

18. What is the length of the painting below? Round your answer to the nearest tenth of an inch.

59⁰

16 in.

l
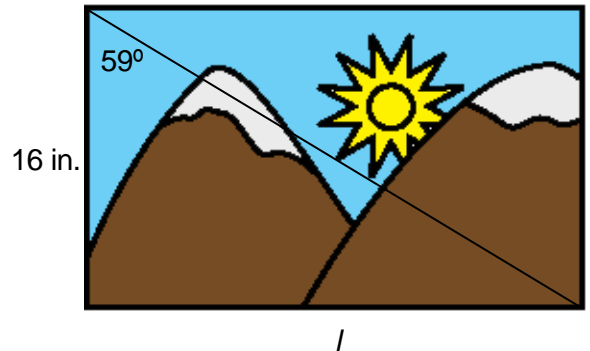
19. What is the sum of the measures of $\angle x$ and $\angle y$, in degrees? (The figure may not be drawn to scale.)

104° x

y

64°

20. Lionel observes that traffic is getting worse and it takes him longer to get to work. He records the time it takes for him to get to work each week for nine weeks.

Week	1	2	3	4	5	6	7	8
Time (min)	6.3	7.1	7.9	8.7	8.5	8.3	10.1	9.9

Lionel plots the data on a scatter plot and finds the best fitting line is $y = 0.3x + 7$. Use his model to predict how long it will take Lionel to get to work on Week 10.
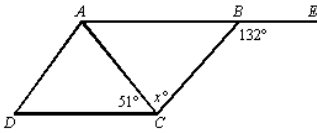
Use for #21-26 efine and sketch the following properties of a circle

 21. Arc

 22. Secant

 23. Radius

 24. Chord

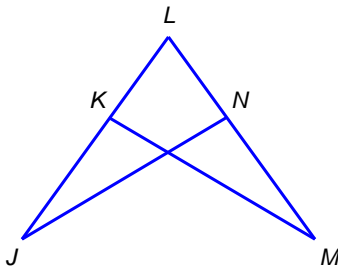 25. Center

 26. Tangent

27. Can you use the SAS Congruence Postulate to prove that the two triangles are congruent? Explain your reasoning.

28. *ABCD* is a parallelogram. Find the value of *x* and explain your reasoning. (The figure may not be drawn to scale.)

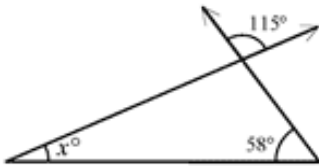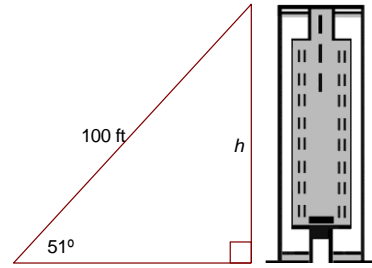29. Given: $\overline{JL} \cong \overline{LM}$

What additional information is needed to prove the triangles congruent by SAS?

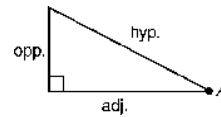30. Find the value of *x*. The diagram is not to scale.

31. What is the height of the building shown below? Round to the nearest tenth if necessary.

32. In a 45°-45°-90° triangle, the ratio of the length of the hypotenuse to the length of a side is _____.

33. The cosine of $\angle A$ is the ratio _____.

34. To find the height of a tower, a surveyor positions a transit that is 2 meters tall at a spot 95 meters from the base of the tower. She measures the angle of elevation to the top of the tower to be 32°. What is the height of the tower, to the nearest meter?

Rewrite in slope-intercept form. Then find the slope and *y*-intercept of the line.

35. $8y - 9x = 72$

Find the value of *x*. (The figure may not be drawn to scale.)

36.
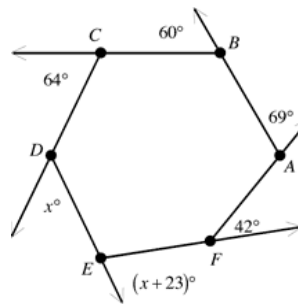
Find the product.

37. $(x + 7)\left(x^2 - 4x + 2\right)$

38. The standard equation of a circle with center $(-4, 3)$ and radius 7 is _____.

39. The inside of an ice cream cone is filled with ice cream and has radius $6\ cm$ and height $12\ cm$. Assuming that a half-scoop of ice cream is in the shape of a hemisphere, and that it fits perfectly on top of the cone (same radius), find the total volume of ice cream. Use 3.14 for $\square$ and round your answer to the nearest tenth.

40. Find the mean, median, and mode of the data. Round your answers to the nearest tenth if necessary.
16, 29, 14, 2, 38, 9, 29, 29

41. The table below gives the average cost of a vacation compared to the miles traveled during the vacation. Make a scatter plot of the data. Then tell whether the data have a *positive correlation*, a *negative correlation*, or *relatively no correlation.*

Miles Traveled	Vacation Cost
415	$451
153	$255
193	$376
355	$410
63	$237

42. There is a known relationship between forearm length (*f*) and body height (*h*). The table and accompanying scatter plot show arm lengths and heights from a randomly selected sample of people. Use a graphing calculator to find an equation of the least-squares line for the data.

Forearm length (cm)	24	27	24	32	30
Body height (cm)	157	177	164	195	178

43. How many triangles are formed by drawing diagonals from one vertex in the polygon? What is the sum of the measures of the angles in the polygon?
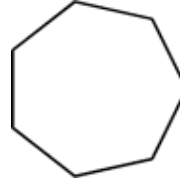

44. A ball is dropped from the top of a cliff. The ball's height after *t* seconds can be found using the polynomial $-16t^2 + 522$. What is the ball's height after 4 seconds?

45. How many different arrangements can be made using all of the letters in the word TOPIC if each letter is used exactly once?
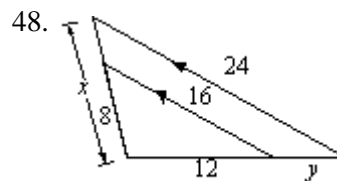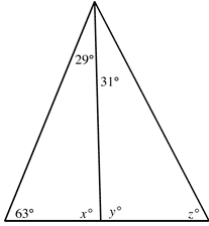
Simplify. Write your answer using exponents.

46. $\left(4t^2r^4\right)^3$
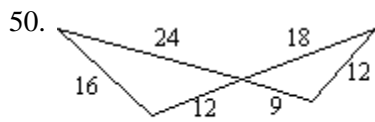
47. Find the area of the shaded region.
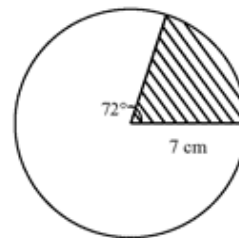
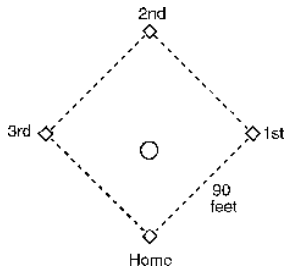**The polygons in each pair are similar. Find the value of each variable.**

48.

49. Find the values of *x*, *y*, and *z*. (The figure may not be drawn to scale.)


Tell whether each pair of triangles is similar. Explain your reasoning.

50.

51. A baseball "diamond" is a square of side length 90 feet. How far is the throw, to one decimal place, from home plate to second base?

52. The world's largest land animal is the African bush elephant which can grow to heights of up to 13 feet. From a mouse's perspective, what is the angle of elevation to the top of the elephant below? Round your answer to the nearest tenth of a degree and show your work.
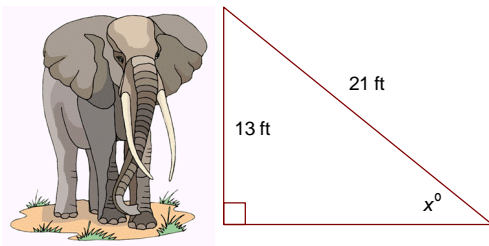

53. A 14-foot ladder is placed against the side of a building, forming a right triangle as shown in Figure 1 below. The bottom of the ladder is 8 feet from the base of the building. In order to increase the height to which the ladder reaches, the ladder is moved 5 feet closer to the base of the building as shown in Figure 2.
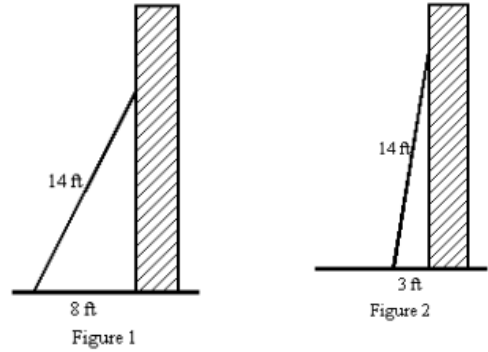

Figure 1

Figure 2

To the nearest foot, how much farther up the building does the ladder now reach? Show how you arrived at your answer. (The figures may not be drawn to scale.)

54. A parasailing company uses a 50-foot cable to connect the parasail to the back of the boat. About how far is the parasail from the water when the cable has a 35° angle of elevation? Explain how you got your answer.
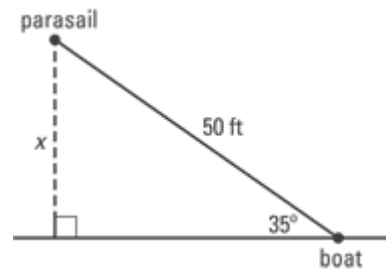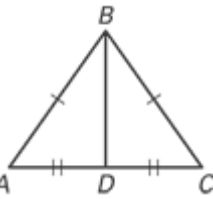
55. Refer to the figure below. Give a reason to justify the statement.
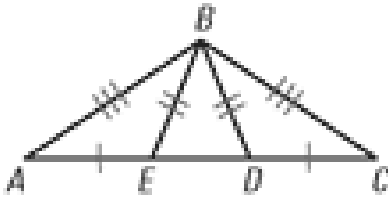
$\angle CDO \cong \angle COD$
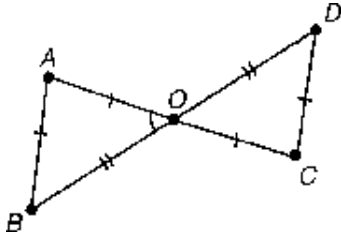
Decide whether it is possible to prove that the triangles are congruent. If it is possible, tell which **congruence postulate** or **theorem** you would use.

56.

Use the diagram to decide whether the congruence statement is true. Explain your reasoning.
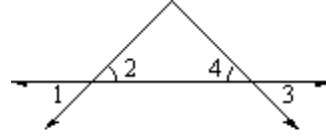

57. $\triangle ABD \cong \triangle CBE$

58. Line l passes through $(1,1)$ and $(-2,-8)$. Graph the line perpendicular to l that passes through $(-2,2)$.

59. Complete the proof.
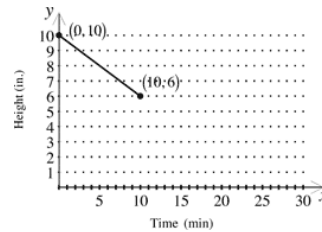Given: $\angle 2 \cong \angle 4$
Prove: $\angle 1 \cong \angle 3$

Statement	Reason
1. ?	1. ?
2. $\angle 1 \cong \angle 2; \angle 4 \cong \angle 3$	2. ?
3. $\angle 1 \cong \angle 4$	3. ?
4. ?	4. ?

60. The graph shows a fitted line for the height of a candle after burning for several minutes.
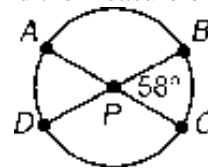

a. Find the slope and y-intercept for the fitted line.
b. Write an equation for the fitted line.
c. Estimate the height of the candle after 20 minutes.

Factor the polynomial completely.

61. $x^2 + 7x + 9x + 63$

62. Find the measure of $\overset{\frown}{DBC}$ in $\odot P$.

63. A 55-foot long irrigation sprinkler line rotates around one end as shown. The sprinkler moves through an arc of 140° in 0.95 hours. Find the speed of the moving end of the sprinkler to the nearest tenth of a foot per minute. Use 3.14 as an approximation for π.
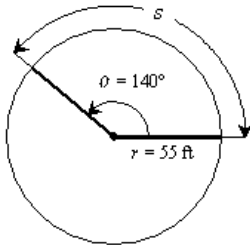

64. A round pizza, with diameter 42 cm, is cut into 12 equal sectors. A square pizza, with side length 52 cm, is cut into 9 equal squares. Which pizza slice, sector or square, has the greatest area? How much greater is it, to the nearest tenth of a square centimeter?

Find the surface area of the right prism or right cylinder. Round the result to two decimal places.
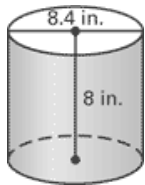
65.

Find the area of a lateral face of the regular pyramid. Then find the surface area of the regular pyramid. Round the results to one decimal place.
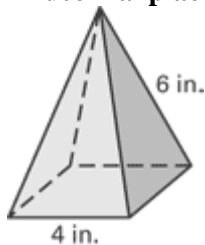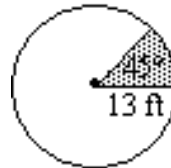

66.

Simplify the polynomial and write it in standard form. Then state whether it is a *monomial,* a *binomial,* or a *trinomial.*
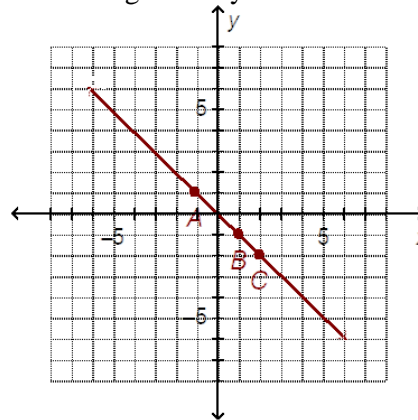
67. $7 + 2x^2 + 8x - 3 - 6x^2 - 1$

68. The distance around the equator of Neptune is about 154,566 km. To the nearest kilometer, what is the equatorial diameter of Neptune? Use $\pi = 3.14$.

Find the area of the shaded sector to the nearest whole number.

69.

70. Points A, B, and C lie on the line $y = -x$. Dilate these points by a scale factor of 4 with respect to the origin. Use your results to draw a conclusion.

| $A\,(-1,\,1)$	A'
$B\,(1,\,-1)$	B'
$C\,(2,\,-2)$	C'

71. A triangle has the vertices $P(6,9), Q(15,9),$ and $R(15,18)$. The image of $\triangle PQR$ after a dilation of $\frac{1}{3}$ with respect to the origin is $\triangle ABC$.

Part A Sketch $\triangle PQR$ and $\triangle ABC$.

Part B Use coordinate geometry to prove $\triangle ABC \sim \triangle PQR$.

72. A bus is traveling at an average rate of 60 miles per hour. Explain how you can use a proportion to find how long it will take the bus to travel 250 miles.

73. Triangle *RST* is isosceles, with $\overline{RS} \cong \overline{ST}$ and $\angle SRT \cong \angle STR$. (The figure may not be drawn to scale.)
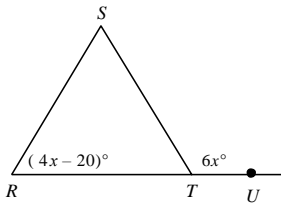
Part A Write an equation that can be solved to find the value of *x*. Explain the origin of the equation.
Part B Solve the equation in Part A and use the answer to find the measure, in degrees, of $\angle SRT$.

74. From 2000 to 2005, the average price *p* (in dollars) and average cost *c* (in dollars) for each toy a company produces can be modeled by the functions $p(x) = 5 + 0.5x$ and $c(x) = 0.1x^2 - 0.5x + 2.4$, where *x* is the number of years since 2000. The number of toys the company sold *q* since 2000 can be modeled by the function $q(x) = 5000 + 2000x$.
a. The total profit is the difference between the average price and the average cost for the total number of toys sold. Write a model for the total profit.
b. According to the model found in part (a), what happens to the total profit over time?

75. The net for the can used by a company for its beef stew is shown below. The can is designed to be as tall as it is wide. The amount of steel used to make the can is determined by the formula for the surface area of a cylinder, which is $S.A. = 2\pi r^2 + 2\pi rh$. (The figure may not be drawn to scale.)
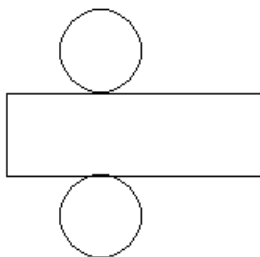
Originally, the entire can used 1206.26 square centimeters of steel. The can is being resized so that it is 80% as wide and 80% as tall as it was originally.

Part A When the width and the height of a cylinder are the same, how can the formula $S.A. = 2\pi r^2 + 2\pi rh$ be rewritten so that the only variable on the right side is *r*? Explain.
Part B How many square centimeters of steel are needed to make the new can? Show your work. Use 3.14 as an approximation for π and round your answer to the nearest square centimeter.