Answers
for Grade 8 Group Assignments - Quarter #2

<u>Notes</u>:

- Answers for group assignment problems that are out of the workbook can be found in the "G8 Workbook Answer Key".
- This answer key doesn't include all answers.

Week 9

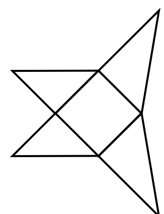
- Part III - Ptolemy's Quadrilateral Theorem
  1) Create a right triangle by using the long diagonal (also the diameter of the circle), which has a length of 170cm. Then, the upper right triangle gives us that the fourth (shortest) side of the quadrilateral is 26cm.
  2) Using Ptolemy's Quadrilateral Theorem, the sum of the products of the opposite sides is $26 \times 154 + 72 \times 168 = 16{,}100$, which must be equal to the product of the diagonals. Therefore, the shorter diagonal must be $16100 \div 170 \approx$ **<u>94.7cm</u>**
  3) Using the two right triangles, we get an area of $\frac{1}{2} \times 26 \times 168 + \frac{1}{2} \times 72 \times 154 =$ **<u>7728 cm^2</u>**

Week 10

No answers needed

Week 11

- (Thursday) The net for the "tilted pyramid" is shown on the right.
  Note that all of the triangles are right triangles.
  Can you see which edges must be of the same length?



Week 12

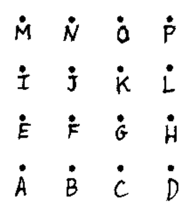
Tuesday: 1) 169.65 cm^3 2) 56.55 cm^3 3) 113.1 cm^3 4) $2\pi r^3$ 5) $\frac{4}{3}\pi r^3$

Thursday:

Quarter-Circle Problem: 28.27 cm^2

Week 13

Connect-the-Dot Triangles



One systematic approach is to find all of the triangles that have a certain length side, and then move to another length side, being careful not to list one that is congruent to another previously listed triangle. Using this method, we get the following:

9 triangles have a side length = 1:
ABF, ABG, ABH, ABJ, ABK, ABL, ABN, ABO, ABP

8 triangles have a side length = 2:
ACF, ACH, ACJ, ACK, ACL, ACN, ACO, ACP
(not ACG because it is congruent to ABJ, listed above)

4 triangles have a side length = 3: ADG, ADK, ADO, ADP

3 triangles have a side length = $\sqrt{2}$: EBK, EBL, EBP

2 triangles have a side length = $\sqrt{5}$: ECL, ECP, MFD

1 triangle has a side length = $\sqrt{8}$: ICP

Therefore, there are <u>a total of 28 non-congruent triangles</u>.

Week 14

Tuesday:

1) $6m^2$
2) $54m^2$
3) 9 times
4) $84\ m^2$
5) $336m^2$
6) 4 times
7) $12.57m^2$ or $4\pi\ m^2$
8) $1256.64\ m^2$ or $400\pi\ m^2$
9) 100 times
10) If the scale factor of two similar figures is a:b, then the ratio of their areas is $a^2:b^2$.
    - Example: If circle B has 3 times the circumference of circle A, then circle B has 9 times the area of circle A.
11) $60\ m^2$
12) $252\ m^2$

Thursday:

13) Kate's grandfather: He was <u>89 years old</u> in 1981. (In 1936 he was $\sqrt{1936} = 44$.)
14) The circumference of the full circle (of the circle sector) is 12π. So ⅓ of that is 4π, which is also the circumference of the resulting cone. So the radius of the cone is 2 inches. The edge of the cone is 6 inches. Therefore, we know that the height of the cone is $\sqrt{32}$, or ≈ 5.66. We can then easily find the volume of the cone to be **<u>$23.7\ in^3$</u>**.

Week 15

2) a) $9{,}800\ in^2$

   b) $20\ m^2$

   c) The circumference of the larger sphere is twice the smaller sphere.
   The volume of the larger sphere is 8 times greater than the smaller – so it is $96\pi\ cm^3$?

3) At first glance, it may seem that this extra 1000 feet would somehow be spread out across the whole equator, and therefore the rope would barely be above the ground. But this is not the case. Whether the rope is going around the equator of the earth, the moon, or Jupiter doesn't matter; either way (as long as it is 1000 feet longer than that equator) it will be the same height above the ground. If we increase the length of a circle's radius by x, then its circumference increases by $2\pi x$. Instead, if we increase a circle's circumference by x, then its radius increases by $x \div 2\pi$.

   With the problem at hand, we can say that if a circle's circumference increases by 1000, then its radius increases by $1000 \div (2\pi) \approx 159$. Therefore, the rope going around the equator will be <u>about 159 feet high – far too high for any horse to jump over</u>.

4) From problem #14 on last week's groups assignment, we can see that because the circle sector is ⅓ of the whole circle, the ratio of radius of the circle sector to the radius of the cone was 3:1. For this week's problem, we are given that the cone has a 10cm diameter and a 12cm height. This means the length of the edge is 13cm. If we slice the cone down along the edge, and lay it flat, the resulting circle sector will have a radius of 13cm. Since the ratio of radius of the circle sector to the radius of the cone is 13:5, we know that the area of the circle sector (which is also the surface area of the original cone) must be $^5/_{13}$ of the area of the circle sector's full circle. This full circle has an area of $\pi \times 13^2$. Therefore, the surface area of the cone (which is also the area of the circle sector) is $^5/_{13} \times \pi \times 13^2$, which is **<u>$65\pi \approx 204\ cm^2$</u>**.

Week 16

2) Perhaps it is best to imagine one person at a time entering a room, and shaking hands with each of the people already in the room. The second person shakes hands once upon entering, the third person shakes hands twice upon entering, the fourth person three times, etc. The question then becomes: "What does n need to be such that the sum of the numbers from 1 to n will equal 120?" After some trial and error, or perhaps working with Gauss's formula, we see that n must be 15, which means that 16 people are required in order to have 120 handshakes. We can check our answer by realizing that all 16 people, in the end, will shake hands 15 times. If we multiply $15 \cdot 16$, we get 240, but we divide by 2 (to get 120 handshakes) because otherwise each handshake would be counted twice.