RELATED RATES

Directions: Solve the following related rates problems. Find the correct answer and fill in the blanks to discover a quote from Albert Einstein.

1. A certain calculus student hit his calculus teacher in the head with a snowball. If the snowball is melting at the rate of 10 cubic feet per minute, at what rate is the radius changing when the snowball’s radius is 2 feet?

2. A baseball diamond is 90 feet square. Coach runs from first base to second base at 25 feet/second. How fast is he moving away from home plate when he is 30 feet from first base?

3. Water flows at a rate of 8 cubic feet per minute into a cylinder with radius 4. How fast is the water level rising?
4. A swimming pool which is a cone with a height of 20 meters and a radius of 5 meters is being filled with a hose which pumps water at the rate of 3 cubic meters per minute. When the water level is 2 meters, how fast is the level of the water rising?

5. A stone is dropped into Lake Mead, causing circular ripples whose radii increase by 2 m/sec. How fast is the disturbed area growing when the outer ripple has radius 5?

6. A fish is being reeled in at a rate of 2 m/sec (that is, the fishing line is being shortened by 2 m/sec) by the Old Man by the Sea. If he is sitting 30 meters above the water, how fast is the fish moving through the water
   a. when the line is 50 meters long?

   b. when the line is only 31 meters?
7. A spherical balloon is being inflated such that its volume at time $t$ is given by $V(t) = 3t$, where time is measured in seconds and volume in cubic meters.

   a. How fast is the radius increasing when the radius is half a meter?

   b. How fast is the radius increasing when time is $t = 12$ seconds?

Answers:

$20\pi$  everything  \(\frac{1}{2\pi}\)  counts

$\frac{5}{2}$  not  \(\frac{25}{\sqrt{10}}\)  counted

$\frac{12}{\pi}$  be  \(-\frac{5}{8\pi}\)  that

$\frac{3}{\pi}$  and  \(\frac{62}{\sqrt{61}}\)  can

#6a  #5  #1  #6b

#4  #2  #3  #7a

#6a  #5  #1  #3

#6b  #4  #2
You didn’t think that was all, did you??

MATHEMATICAL DEFINITIONS – GEOMETRY
Fill in the blanks of the following definitions by using the words listed on the next page.

Definitions:

1. To indicate something with your finger: __________________________

2. “It’s a bird! It’s a _____________. It’s Superman!”

3. “Don’t go off on a ____________, stay on the subject!”


5. Very Vedel, upon being healed of his blindness, shouted, “_______________.

6. The zookeeper affectionately referred to the two newborn lion cubs as a ____________ _____________.

7. Fred Freezin, local ice plant manager, described his uncomfortable working conditions as follows, “It’s ______________.”

8. B.A. Square, the noted Buffalo Hunter and Zoid Catcher, entitled his latest book, “How to ______________.”

9. A broken angle: ________________

10. What Noah built: ________________

11. A combination of three or more tones sounded together in harmony: ________________

12. What the prison inmate did to while away his time by raising insects: ________________

13. John Handley asked the bus driver whether he stopped at Eleventh and G Streets, and the bus driver replied, “_______________.

14. A place where criminals are sent: ________________

15. Dashing Dan, the movie hero, straight-forwardly accused the crooked gambler of being a ________________.

16. A Sultan’s Act: ________________

17. Why the greeting card came after your birthday: ________________

18. When Leonardo Boloni, the Italian math student, heard about the ban on firearms, he exclaimed, “You mean-a-we-can’t-a-have-a-______________!.”
19. A tall kettle on the fire: ________________

20. Bill Harper was introducing his latest girlfriend, Ann, to his buddy, Alex, and he exuberantly exclaimed to him, “______________!"

21. The Roller Derby girl quickly yelled to her teammate, “______________.”

22. The man in charge: ________________

23. A gauge that won’t take nickels: ________________

24. When the hurricane washed the porch into the sea, little Billie exclaimed, “______!”

25. How a farmer might greet another: “__________”

26. What the little acorn said when it grew up: “______________”

27. What to do when it rains: ________________

28. What to call a dead parrot: ________________

29. An impotent witch’s spell: ________________

30. An ill insect: ________________

31. King of the Jungle: ________________

32. The son of Mr. and Mrs. Kole, who became a knight: ________________

33. How to track a woman criminal: ________________

34. Lewis and Clark journeyed here: ________________

35. To be in favor of farm machinery: ________________

36. A dog that is no more: ________________

37. A prisoner’s poem: ________________

38. How the French Revolutionist would get rid of his enemy: ________________

39. What the prisoner magician did on his wife’s birthday: ________________

40. A flattering remark: ________________

41. The English teacher was conducting a grammar lesson on tenses. She said, “Class, I see the leaves, ________________, I have seen the leaves.”

42. After reading these stupid definitions, the math student called his teacher a real _______. 

<table>
<thead>
<tr>
<th>Unit Five (Part 1)</th>
<th>AP Calculus Take-Home Packet</th>
<th>Related Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answers:</td>
<td>MEDIAN</td>
<td>CONVERSE</td>
</tr>
<tr>
<td>SECANT</td>
<td>CONVERGE</td>
<td>RULER</td>
</tr>
<tr>
<td>POSTULATE</td>
<td>PROTRACTOR</td>
<td>CENTER</td>
</tr>
<tr>
<td>COMPLEMENT</td>
<td>COMPASS</td>
<td>SQUARE</td>
</tr>
<tr>
<td>TRAPEZOID</td>
<td>PENTAGON</td>
<td>DEGREE</td>
</tr>
<tr>
<td>AXIOM</td>
<td>ARC</td>
<td>POLYGON</td>
</tr>
<tr>
<td>VERTICES</td>
<td>DEGREE</td>
<td>LINE</td>
</tr>
<tr>
<td>DIAMETER</td>
<td>HYPOTENUSE</td>
<td>LINE</td>
</tr>
<tr>
<td>COINCIDE</td>
<td>CHORD</td>
<td>ORIGIN</td>
</tr>
<tr>
<td>GEOMETRY</td>
<td>RECTANGLE</td>
<td>DECAGON</td>
</tr>
<tr>
<td>POINT</td>
<td>COLLINEAR</td>
<td>CIRCLE</td>
</tr>
<tr>
<td>LOCI</td>
<td>HYPOTENUSE</td>
<td>RHOMBUS</td>
</tr>
<tr>
<td>NONAGON</td>
<td></td>
<td>PRISM</td>
</tr>
<tr>
<td>ISOSCELES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXTERIOR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLANE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PARALLEL LINES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONGRUENCE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOCUS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEXAGON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONCENTRIC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TANGENT</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>