**2014 Interschool Answer Key**

**SPORTS**

I. 1. Pittsburgh Steelers

2. a) Princeton b) Alabama

3. 11 (1+3+7)

4. 5 (Athletics, Padres, Dodgers, Giants, Angels)

5. Dream Team

6. Wilt Chamberlain

7. a) Rafael Nadal b) Roger Federer, Pete Sampras, or William Renshaw

8. Brazil

II.

1. **22** - Without LeBron, there are 7 players in the tournament. 7C2 = 21. Add 1 for the final matchup between LeBron and the winner, for a total of 22.

2. **153** - Use the equation v2=v1+a(t), but be especially mindful of the units. When done correctly, the acceleration and time conversions cancel each other out, providing a final answer of 200 – 47 = 153 mi/hr.

3. **He started at any point on the line of latitude** $1+\frac{1}{2π}$ **miles from the South Pole.**

4. **Switch cars.**

ECONOMICS

I. 1. Adam Smith

2. Externalities

3. a) inventor of dynamite

 b) A Beautiful Mind

 c) Schizophrenia

 d) Prisoner’s Dilemma

4. a) Ronald Reagan

 b) John Maynard Keynes

5. a) monopsony (not monopoly)

 b) economies of scope (not economies of scale)

 c) GNP, or Gross National Product (not GDP)

 d) imperfect competition (not perfect competition)

 e) normative economics (not positive)

II.

1. a) **1/40** - Marginal cost is determined by the supply curve. Rearrange to get P = (QS-60)/40. Marginal cost is defined as $\frac{∂P}{∂Q}$ = 1/40.

b) **$1.22** - This is an algebra question. We make a system of 4 equations in 4 variables (QD, QS, Pb, Ps), and solve:

1. QD = 150 – 50Pb (Demand)

2. QS = 60 + 40Ps (Supply)

3. QD = QS (Supply must equal demand)

4. Pb – Ps = .5 (The government must receive $.50 per widget)

Solving yields Ps = .72, and so Pb = $1.22.

c) **$2.75** - Plug the result from (b) back into either the supply or demand equation to give a new quantity of 89. Set the original supply and demand equal to see that the original quantity bought/sold was 100. The difference is 11. Plug this into the given equation: .5(11)($0.50) = $2.75.

2.

a) $a>0, b$**: all reals** - the second derivative is $-.25aw^{-1.5}$, which is negative when a is positive. It does not matter what b is.

b) **$39** - Uninsured, his expected utility is EU = $.1\sqrt{100}+ .9\sqrt{400}=19.$ To match an expected utility of 19, Fraz would need to have wealth of 192, or $361. By purchasing an insurance policy at $39, he is guaranteeing himself a utility of 19. If the policy were any less expensive, he would prefer to buy it; any more, and he would prefer to go uninsured.

**POP CULTURE**

I. 1. D

2. C

3. E

4. A

5. D

6. B

7. A

8. C

9. C

10. B

II.

1. **1/3** – there are 4 possibilities for the two children (BB, BG, GB, GG). Since we know one is a girl, drop the BB possibility. One of the remaining three is the wanted GG.

2. **2, 2, 9** – Let's start with the known product: 36. Write down the possible combinations giving the product of 36. Knowing that the sum is not enough to be sure, there are two possible combinations with the same sum (1-6-6 and 2-2-9). And as we learned further that the oldest son has the illness, it is clear that the correct combination of ages is 2-2-9, where there is exactly one of them the oldest one.

3. **Switch, 2/3** (both answers needed for credit) – There is a well-known solution using conditional probability. Alternatively, at the start of the game, there is a 2:3 chance that you will pick a door with a small prize behind it. If you do, the host will reveal the other small prize, and switching doors will get you the car. There is a 1:3 chance you will pick the car. The host will then reveal the foosball table. Switching puts you out of luck. So, 2 out of 3 times switching gets the car.

4. **KEEP** – Keep is the dominant strategy here. A Nash equilibrium diagram shows this clearly: no matter what the other contestant says, it is optimal for “ours” to say KEEP. If the other contestant had said SHARE, ours would get all the money. If the other had said KEEP, our contestant would prefer that they both get nothing, so should also say KEEP.

**THE SCIENCES**

I. 1. Oxidizing agent or oxidant

2. Kirchhoff’s Rules

3. Transform Fault Margins

4. The Coriolis Force/Effect

5. Declination

6. Magnesium, Calcium, Nitrogen, Carbon

7. Dopamine

8. Water vapor

9. 1; 2

10. 36

II.

1. **12:44** – Trick question, no math necessary.

2. **160** – *q*2 = .36 (since 360/1000 express the recessive phenotype), so *q* = 0.6 and *p* must be 0.4.

*p*2 represents the proportion of homozygous dominant = .16, or 160 individuals.

3. **10** – *a* = 2, *b* = 3, *c* = 1, *d* = 6, so the expression = 10.

4. **40** – The particle travels in a circular path with constant kinetic energy (implying constant speed), so the net force on the particle is just the centripetal force:

$$F=\frac{mv^{2}}{r}=\frac{2(.5mv^{2})}{r}=\frac{2K}{r}=\frac{2(4 J)}{0.2 m}=40 N$$

5. **0.01** – The charge on each plate has magnitude *Q* = *CV* = (2x10-3 F)(5 V) = 0.01 C.

POTPOURRI

I.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Marriott  | Shell | Nike | Playboy | Pepsi | Atari  |
| Sporcle  | Toyota  | Prudential  | AT&T | Chrysler | Adobe  |
| Deere  | McDonald’s | United Airlines | Honda  | Safeway | Yahoo  |
| Chevron | Motorola | Mercedes-Benz | American Airlines | America Online | Mazda |
| Hilton Hotels | Taco Bell | Volkswagen | Boeing | General Mills | Guinness |
| Sprint Nextel | Anheuser-Busch | Audi | Microsoft Windows | DreamWorks SKG | Apple |

II.

1. My (also accept “Speaker’s”) son

2. 1 – just the speaker, since he crossed the paths of the others, they must not be headed in the same direction as him

3. A coffin

4. Sunday

5. Never – the boat will rise with the tide

6. She was walking (accept related answers)

7. Pi ($π$) – the number of letters in each word of the poem make up the digits of pi.

8. Thursday

9. A) lying monkey

 B) lying man

10. a) silver box

 b) golden box

III.

1. 60 minutes in an hour

2. 12 signs of the zodiac

3. 13 stripes in the united states flag

4. 90 degrees in a right angle

5. 100 cents in a dollar

6. 13 loaves in a baker's dozen

7. 7 wonders of the world

8. 9 lives of a cat

9. 23 pairs of chromosomes in the human body

10. 32 is the temperature in degrees Fahrenheit at which water freezes