

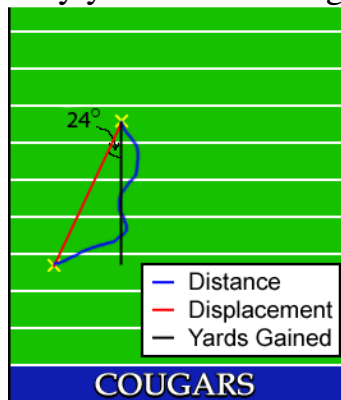
## Chapter 2 Sample questions

- 1) The world record times for the women's 50m, 100m, 200m, and 400m sprint races are 5.96s, 10.49s, 21.34s, and 47.60s respectively. Which world record race was run at the fastest average speed?

$$50\text{m: } speed = \frac{50\text{m}}{5.96\text{s}} = 8.39\text{m/s} \quad 100\text{m: } speed = \frac{100\text{m}}{10.49\text{s}} = 9.53\text{m/s}$$

$$200\text{m: } speed = \frac{200\text{m}}{9.37\text{s}} = 8.39\text{m/s} \quad 400\text{m: } speed = \frac{400\text{m}}{47.60\text{s}} = 8.40\text{m/s}$$

- 2) Brent ran with the football 40 yards before being tackled. The straight-line distance between where he began the run and was tackled was 32 yards. This line makes an angle of  $24^\circ$  with the sideline.
- What was Brent's distance traveled?  
40 yd
  - What was Brent's displacement?  
32 yd
  - How many yards did Brent gain from where he received the ball?



29yd

- 3) Ty pitches a baseball at 101 mph. If the horizontal distance from where the ball is released to the plate is 17.5 m, how much time does the batter have to contact the ball from when it is released?

$$101\text{mph} \left( \frac{1609\text{m}}{1\text{mile}} \right) \left( \frac{1\text{hour}}{3600\text{s}} \right) = 45.1\text{m/s}$$

$$s = \frac{d}{t} \quad t = \frac{d}{s} = \frac{17.5\text{m}}{45.1\text{m/s}} = .39\text{s}$$



- 4) Following is a list of the cumulative 10 m splits for Justin Gatlin at the 2005 USATF Nationals. What was the speed in m/s for the fastest 10 m of the race?

10m	20m	30m	40m	50m	60m	70m	80m	90m	100m
1.97	3.02	3.95	4.84	5.72	6.58	7.43	8.33	9.22	10.08

Try on all intervals; this one ends up being the fastest.

$$\text{topspeed} = \frac{10}{(7.43 - 6.58)} = 11.76 \text{ m/s}$$



- 5) Following is a list of the cumulative 10 m splits for Shawn Crawford at the 2005 USATF Nationals. What were Justin Gatlin's and Shawn Crawford's average speeds for the final 30 m (from 70-100 m)?

10m	20m	30m	40m	50m	60m	70m	80m	90m	100m
1.97	3.02	3.99	4.88	5.77	6.66	7.51	8.41	9.29	10.17

$$\text{Justin} : \frac{30}{(10.08 - 7.43)} = 11.32 \text{ m/s}$$

$$\text{Shawn} : \frac{30}{(10.17 - 7.51)} = 11.28 \text{ m/s}$$



- 6) Following is a list of the cumulative 10 m splits for Leonard Scott at the 2005 USATF Nationals. Consider Leonard's initial times and speeds compared with the other two athletes?

10m	20m	30m	40m	50m	60m	70m	80m	90m	100m
1.90	2.92	3.82	4.74	5.62	6.49	7.37	8.31	9.23	10.18

Leonard was leading the race until 90m and ended up third. Even in such a short race, the ability to maintain a given speed is critical.

Also, notice that Leonard's top speed was lower than both other athletes, but by getting to *his* top speed sooner, he nearly won the race.