

Limits, Probability, and Statistics: math test solutions, Grade 12 – download the PDF

Test solutions with the detailed point scale. Add up your points and spot what to review.

Suggested time: 45 minutes. Out of 20 points. Calculator allowed only when the problem says so.

1 Limits

/ 4 pts

a. $\frac{(x-5)(x+5)}{x-5} = x+5 \rightarrow 10$. (1 pt)

b. Equal degrees: $\frac{6}{3} = 2$. (1 pt)

c. Left: $2 + 3 = 5$ (0.5 pt). Right: $2^2 - 1 = 3$ (0.5 pt). They differ, so the limit does not exist (1 pt).

2 Asymptotes

/ 3 pts

Factor the denominator: $(x-3)(x+3)$. The numerator $4(x-2)$ shares no factor. (1 pt)

Vertical asymptotes: $x = 3$ and $x = -3$. (1 pt)

Horizontal asymptote: degree 1 below degree 2, so $y = 0$. (1 pt)

3 Counting

/ 3 pts

- a. Order matters: $P(9, 3) = 9 \cdot 8 \cdot 7 = 504$. (1.5 pts)
- b. Order does not matter: $C(9, 3) = \frac{504}{6} = 84$. (1.5 pts)

4 A café survey

/ 3 pts

$$P(P) = 0.30 + 0.20 = 0.50. \text{ (0.5 pt)}$$

- a. $P(P | C) = \frac{0.30}{0.55} = \frac{6}{11} \approx 0.545$. (0.75 pt)
- b. $P(C | P) = \frac{0.30}{0.50} = 0.6$. (0.75 pt)
- c. $P(C)P(P) = 0.55 \cdot 0.50 = 0.275 \neq 0.30$, so they are not independent. (1 pt)

5 Seeds and scores

/ 4 pts

- a. $P(X = 5) = C(6, 5)(0.8)^5(0.2) = 6 \cdot 0.32768 \cdot 0.2 = 0.393216 \approx 0.393$ (1.5 pts).
Mean = $6 \cdot 0.8 = 4.8$ seeds (0.5 pt).
- b. $z = \frac{150 - 120}{15} = 2$ (1 pt). About 95% lie within 2σ , so about 2.5% are faster (1 pt).

6 Regression

/ 3 pts

- a. $m = -1.7, b = 5 - (-1.7)(3) = 10.1$, so $\hat{y} = -1.7x + 10.1$. (1.5 pts)
- b. $r = \frac{-17}{\sqrt{300}} \approx -0.98$: a very strong negative linear relationship. (1 pt)
- c. $\hat{y} = -1.7(2.5) + 10.1 = 5.85$. (0.5 pt)



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