

FHS Math 112A Practice Exam - Statistics

SECTION A: MULTIPLE CHOICE

Circle the best answer for each of the following.

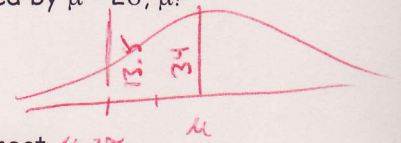
- 1) What percent of data for a normal distribution curve falls within the limits defined by $\mu - 2\sigma$, μ ?

a) 34%

b) 47.5%

c) 68%

d) 95%



- 2) Given a specific situation and population, which of the following statements is correct.

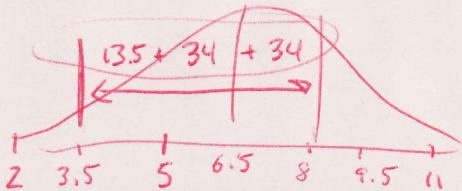
a) μ is random and \bar{X} is randomb) μ is always equal to \bar{X} c) μ is fixed and \bar{X} is randomd) μ is random and \bar{X} is fixedSECTION B: SHORT ANSWER

Put your simplified answer in the box provided.

- 1) Jimmy asks 10% of the grade nines, 10% of the grade tens, 10% of the grade elevens and 10% of the grade twelves for their opinions about the new PED policy. What sampling method did he use?

stratified

- 2) The lifespan of a hair dryer is normally distributed with a mean of 6.5 years and a standard deviation of 1.5 years. What percentage of hair dryers is expected to last between 3.5 and 8 years?



81.5%

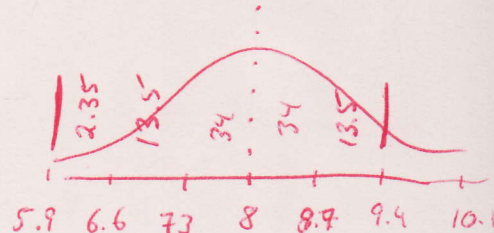
- 3) A report claims that the average family income in a large city is \$32 000. It states the results are accurate 19 times out of 20 and have a margin of error of $\pm \$2500$. What is the confidence level in this situation?

$$\frac{19}{20} = 0.95$$

95%

SECTION C: OPEN RESPONSE

You must show all your calculations to receive full credit.



1. Jim's sleep pattern is normally distributed with a mean of $\mu = 8$ h and a standard deviation of $\sigma = 0.7$ h.
 - a. Sketch and label the normal distribution curve using these results.
 - b. In the last year (365 days), how many nights did Jim sleep between 5.9 to 9.4 hours?

$$(2.35 + 13.5 + 34 + 34 + 13.5) \times 365 = \boxed{355.3 \text{ days}}$$

2. A company claims that its gum will keep its flavor for a mean time of $\mu = 25$ minutes with a standard deviation of $\sigma = 1.5$ minutes. Samples of size 65 were repeatedly collected so that a sampling distribution of the sample mean could be drawn.

- a. Describe the shape of the resulting sampling distribution. *bell/normal*
- b. What would be the mean of the sample means? $\mu_{\bar{x}} = \mu = \boxed{25 \text{ min}}$
- c. What would be the standard deviation of the sample means? $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{1.5}{\sqrt{65}} = \boxed{0.186 \text{ min}}$

3. A random sample of size 83 is collected with a mean of 162 and a standard deviation of 5.4. Based on this sample, answer the following questions.

- a. Determine a 90% confidence interval for this sample mean.
- b. What is the value of the point estimate? $\bar{x} = 162$
- c. What is the value of the margin of error? $z_{\alpha/2} \cdot s_x / \sqrt{n} = 0.975$
- d. How would the interval change if the confidence level were increased to 95%?

a) $n = 83$

$\bar{x} = 162$

$s_x = 5.4$

90% CI $\Rightarrow z = 1.645$

$$\begin{aligned} & \bar{x} \pm \frac{z s_x}{\sqrt{n}} \\ & 162 \pm \frac{(1.645)(5.4)}{\sqrt{83}} \\ & 162 \pm 0.975 \\ & (161.025, 162.975) \end{aligned}$$

d) only z changes

95% CI $\Rightarrow z = 1.96$

$$162 \pm \frac{1.96(5.4)}{\sqrt{83}}$$

162 ± 1.16

$(160.84, 163.16)$

\hookrightarrow larger $z \rightarrow$ larger margin of error
 \rightarrow wider interval

FHS Math 112A Practice Exam - Probability

SECTION A: MULTIPLE CHOICE

Circle the best answer for each of the following.

1) How many different arrangements can you make from the letters of the word **TOOTH**?

- a) $5!$ b) $\frac{5!}{2!}$ c) $\frac{5!}{2!2!}$ d) $\frac{5!}{3!2!}$

2) In the expansion $(x + 3)^5$, the numerical coefficient of the term containing x^3 is?

- a) 90 b) 10 c) 60 d) 54

3) If $P(N) = \frac{1}{4}$, determine $P(\bar{N})$.

- a) $-\frac{1}{4}$ b) $\frac{1}{4}$ c) $\frac{3}{4}$ d) 4

4) In the game "sandwich" 3 cards are dealt from a deck of 52 cards. To win, the value of the 3rd card must be between the first two cards. What is the probability of winning if the first two cards dealt are a 6 and a 10?

- a) $\frac{8}{25}$ b) $\frac{6}{25}$ c) $\frac{3}{13}$ d) $\frac{3}{50}$

SECTION B: SHORT ANSWER

Put your simplified answer in the box provided.

1) The following options are available for a new car :

Color: white¹, navy blue², green³, black⁴, and red⁵
 Stereo: CD player with surround sound¹, standard CD player², cassette player³
 Other: with air conditioning¹, without air conditioning²

How many different cars are possible?

$$5 \times 3 \times 2$$

30

2) Simplify the following expression as a ratio of factorials: $11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$

$$11 \times 10 \times 9 \times \frac{8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1} \times 3 \times 2 \times 1$$

$$\frac{11!3!}{8!}$$

- 3) The probability of winning is $\frac{3}{108}$. What are the ODDS of winning?

$$\begin{aligned} 3 : 105 \\ 1 : 35 \end{aligned}$$

$$1 : 35$$

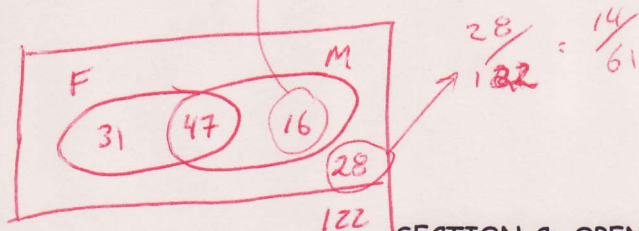
- 4) A physician saw 122 patients in one week. Of these, 78 required a follow-up visit and 63 required medication. Of the 122, 47 required both. What is the approximate probability that a randomly selected patient will require

- a. Only medication?

$$\frac{16}{122} = \frac{8}{61}$$

$$P(M \text{ only}) = \frac{8}{61}$$

- b. neither a follow-up nor medication?



$$P(\overline{F \text{ or } M}) = \frac{14}{61}$$

SECTION C: OPEN RESPONSE

You must show all your calculations to receive full credit.

1. Use Pascal's Triangle or combinations to expand and simplify $(2x - 4)^3$.

$$\begin{aligned} &= {}^3C_0 (2x)^3 (-4)^0 + {}^3C_1 (2x)^2 (-4)^1 \\ &\quad + {}^3C_2 (2x)^1 (-4)^2 + {}^3C_3 (2x)^0 (-4)^3 \\ &= (1)(8x^3)(1) + (3)(4x^2)(-4) \\ &\quad + (3)(2x)(16) + (1)(1)(-64) \\ &= 8x^3 - 48x^2 + 96x - 64 \end{aligned}$$

2. Determine the probability of drawing a spade or a face card from a deck of 52 cards.

$$P(\spadesuit \text{ or Face}) = P(\spadesuit) + P(\text{Face}) - P(\spadesuit \text{ and Face}) = \frac{13}{52} + \frac{12}{52} - \frac{3}{52} = \frac{22}{52} = \frac{11}{26}$$

3. There are 14 people standing outside at the movies, 8 girls and 6 boys. If the manager offers 5 free passes randomly, what is the probability that:

- a. 3 girls get a free pass?
b. at least 4 boys get a free pass?

$$a) P(3g \text{ and } 2b)$$

$$= \frac{{}^8C_3 \times {}^6C_2}{{}^{14}C_5}$$

$$= \frac{(56)(15)}{2002}$$

$$= \frac{840}{2002} = \frac{60}{143}$$

$$b) P(\text{at least } 4b) = P(4b \text{ and } 1g) + P(5b)$$

$$= \frac{{}^6C_4 \times {}^8C_1}{{}^{14}C_5} + \frac{{}^6C_5 \times {}^8C_0}{{}^{14}C_5}$$

$$= \frac{(15)(8)}{2002} + \frac{(6)(1)}{2002}$$

$$= \frac{120 + 6}{2002} = \frac{126}{2002} = \frac{9}{143}$$

FHS Math 112A Practice Exam - Circle Geometry (The diagrams shown are not drawn to scale.)

SECTION A: MULTIPLE CHOICE

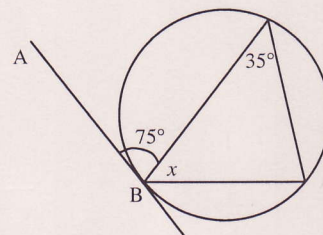
Circle the best answer for each of the following.

1) The longest chord in a circle is referred to as the

- a) perpendicular bisector b) transversal c) segment **d) diameter**

2) In the diagram, AB is tangent to the circle. The measure of $\angle x$ is

- a) 70°** b) 75° c) 110° d) 30°



3) What is the distance from $(-3, -4)$ to the origin?

- a) -5 **b) 5** c) 25 d) -25

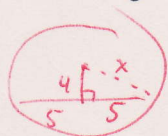
4) What is the equation of a circle with center $(2, -3)$ and a radius of 4, in standard form?

- a) $(x-2)^2 + (y+3)^2 = 4$ b) $\left(\frac{x-2}{4}\right)^2 + \left(\frac{y+3}{4}\right)^2 = 1$
c) $(x-2)^2 + (y+3)^2 = 16$ d) $\left(\frac{x-2}{16}\right)^2 + \left(\frac{y+3}{16}\right)^2 = 1$

SECTION B: SHORT ANSWER

Put your simplified answer in the box provided.

1) A chord 10 cm in length is 4 cm from the centre of a circle. Determine the radius of the circle.



$$\begin{aligned} x^2 &= 4^2 + 5^2 \\ &= 16 + 25 \\ &= 41 \end{aligned}$$

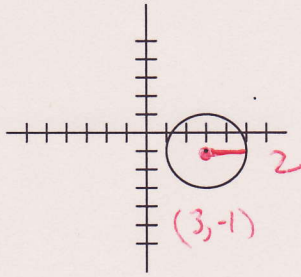
$$\sqrt{41} \text{ or } 6.4$$

2) The circle center is $C(-2, 3)$ and a point $P(-3, -4)$ on the circumference of the circle. Write the equation of the circle in standard form.

$$\begin{aligned} r &= d = \sqrt{(-2 - (-3))^2 + (3 - (-4))^2} \\ &= \sqrt{1^2 + 7^2} \\ &= \sqrt{1 + 49} = \sqrt{50} \end{aligned}$$

$$(x+2)^2 + (y-3)^2 = 50$$

3) State the mapping rule for the circle transformation illustrated below.



$$(x, y) \rightarrow (2x + 3, 2y - 1)$$

4) Find the centre and the radius for a circle with the equation $\left[\frac{1}{4}(x-4)\right]^2 + \left[\frac{1}{4}(y-6)\right]^2 = 1$.

$$C: (4, 6) \quad R: 4$$

5) The equation of an ellipse is given as $\frac{(x+3)^2}{36} + \frac{(y+1)^2}{64} = 1$. Determine the length of the major axis.

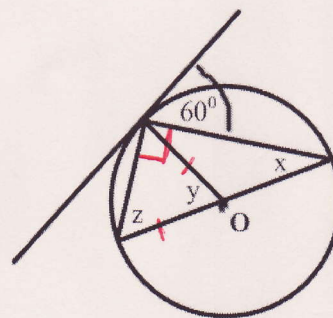
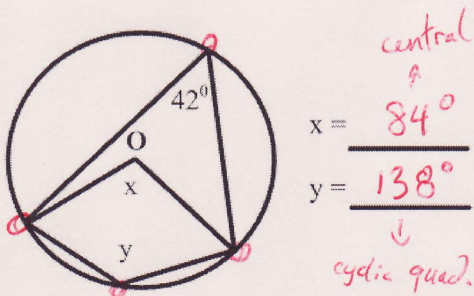
\downarrow
8²
double for axis $8 \times 2 = 16$

16

SECTION C: OPEN RESPONSE

You must show all your calculations to receive full credit.

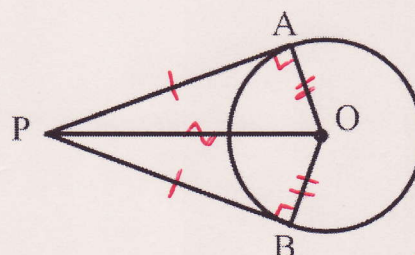
1. Find the values of angles x , y , and z in the diagrams below. Justify your solutions.



2. Prove the following.

Given: O is the centre of a circle
 PA and PB are tangent to circle O

Prove: $\angle POA = \angle POB$



O is centre given
 $PA \perp PB$ tangent given
 $PA = PB$ tangent from P
 $OA = OB$ radii
 $PO = PO$ shared/common
 $\Delta POA = \Delta POB$ SSS
 $\angle POA = \angle POB$ corresponding angles of congruent Δ s

3. A lighthouse sweeps through an angle of 138° . The light can be seen at a maximum distance of 2500 m. What area is illuminated by this lighthouse?



$$A_D = \pi r^2 \frac{\theta}{360^\circ} = \pi (2500)^2 \left(\frac{138^\circ}{360^\circ} \right)$$

$$= 7526732 \text{ m}^2$$

4. The vertices of $\triangle ABC$ are $A(-4,5)$, $B(-10,-3)$ and $C(4,1)$.

- a) Sketch the triangle on the grid provided.
 b) Show that the line segment joining the midpoint of BC to the midpoint of AB is parallel to AC .
 c) Determine the equation of the perpendicular bisector of AB .

parallel \rightarrow equal slopes

$$b) m_{AC} = \frac{1-5}{4-(-4)} = \frac{-4}{8} = -\frac{1}{2}$$

$$m_{DE} = \frac{-1-1}{-3-(-7)} = \frac{-2}{4} = -\frac{1}{2}$$

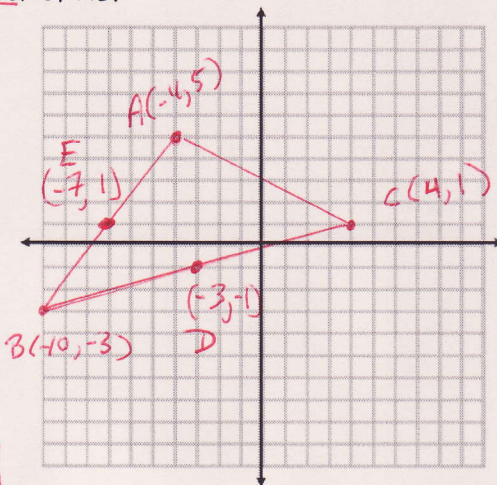
$$c) m_{AB} = \frac{5-(-3)}{-4-(-10)} = \frac{8}{6} = \frac{4}{3} \rightarrow m_{\perp} = -\frac{3}{4}$$

$$y - y_1 = m(x - x_1)$$

$$y - 1 = -\frac{3}{4}(x - (-7))$$

$$y - 1 = -\frac{3}{4}x - \frac{21}{4}$$

$$\rightarrow y = -\frac{3}{4}x - \frac{17}{4}$$



5. The equation of a circle is given by $x^2 + y^2 + 6x - 12y - 7 = 0$. Write this equation in standard form.

$$x^2 + 6x + 9 + y^2 - 12y + 36 = 7 + 9 + 36$$

$$(x+3)^2 + (y-6)^2 = 52$$

6. The equation of an ellipse is given by $\left[\frac{1}{2}(x-4) \right]^2 + \left[\frac{1}{5}(y+3) \right]^2 = 1$.

- a) The centre is (4, -3).
 b) The length of the major axis is 10.
 c) The length of the minor axis is 4.
 d) Sketch a graph of the ellipse.

