

answer key

## Practice Exam - Geometry and Applications 111

### 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  $\mu - 2\sigma$ ,  $\mu$ ?  
a) 34%      b) 47.5%      c) 68%      d) 95%
- 2) Given a specific situation and population, which of the following statements is correct?  
a)  $\mu$  is random and  $\bar{X}$  is random      b)  $\mu$  is always equal to  $\bar{X}$   
c)  $\mu$  is fixed and  $\bar{X}$  is random      d)  $\mu$  is random and  $\bar{X}$  is fixed
- 3) It would be fair to consider a sample to be an "approximation of a binomial experiment" when the population is at least \_\_\_\_\_ times larger than the sample  
a) 40      b) 50  
c) 20      d) 100

#### SECTION 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?  

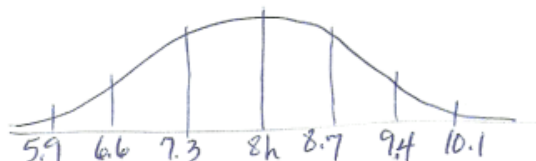
81.5%
- 3) A report claims that the average family income in a large city is \$32 000. It states the results are accurate 19 times out of 20 and have a margin of error of \$2500. What is the confidence level in this situation?  

95%
- 4) Suppose that in a particular city there are 126 000 children and a sample of 8000 children are randomly selected. If these 8000 individuals were asked the question "Did you go "trick-or-treating" on Halloween?", would the results of this survey be reported as a *sample mean* or a *sample proportion*?  

sample proportion

### SECTION C: OPEN RESPONSE

You must show all your calculations to receive full credit.



- Jim's sleep pattern is normally distributed with a mean of  $\mu = 8$  h and a standard deviation of  $\sigma = 0.7$  h.
  - Sketch and label the normal distribution curve using these results.
  - In the last year (365 days), how many nights did Jim sleep between 5.9 to 9.4 hours? *355 nights*
- 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.
  - Describe the shape of the resulting sampling distribution. *bell / normal distribution curve*
  - What would be the mean of the sample means?  *$\mu_{\bar{x}} = \mu = 25 \text{ min}$*
  - What would be the standard deviation of the sample means?  *$\sigma_{\bar{x}} = 0.186 \text{ min}$*
- 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.
  - Determine a 90% confidence interval for this sample mean. *(161.025, 162.975)*
  - What is the value of the point estimate? *162*
  - What is the value of the margin of error? *0.975*
  - How would the interval change if the confidence level were increased to 95%? *wider interval*
- According to a telephone company that serves 1,450,000 households, 31% of these households have unlisted numbers. If random samples of size 350 were repeatedly collected from this population, what would be the mean and the standard deviation of the distribution of the sample proportion?  *$\mu_{\hat{p}} = 31\%$   
 $\sigma_{\hat{p}} = 0.025 = 2.5\%$*
- There are 6250 school teachers in a particular province. Suppose that 250 randomly selected teachers in this province were asked whether they thought that each student in the school system should be provided with a laptop computer. Of those surveyed, 157 responded that students should be provided with laptops.
  - Calculate the 99% confidence interval for the proportion of all teachers in this province who believe that each student should be provided with a laptop computer. *(0.550, 0.706) = (55.0%, 70.6%)*
  - How could you change the survey in such a way that you narrow the confidence interval without changing the 99% confidence level? *Increase the sample size, n.*

### 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 3<sup>rd</sup> 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: white, navy blue, green, black, red<sup>5</sup>

Stereo: CD player with surround sound, standard CD player, cassette player<sup>3</sup>

Other: with air conditioning, without air conditioning<sup>2</sup>

How many different cars are possible?

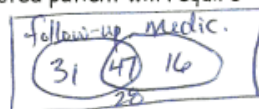
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2) Write the following expression using factorial notation:  $11 \times 10 \times 9 \times 3 \times 2 \times 1$

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

3) 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. Record these data in a Venn diagram. Based on these data, what is the probability that a randomly selected patient will require

a. only medication?



$\frac{8}{61}$

b. neither a follow-up nor medication?

$\frac{14}{61}$

### 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  $(2x - 4)^3$ .

$$8x^3 - 48x^2 + 96x - 64$$

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

$$\frac{11}{26}$$

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

a. exactly 3 girls get a free ticket?

$$\frac{60}{143}$$

b. at least 4 boys get a free ticket?

$$\frac{9}{143}$$

4.

	Brush teeth twice a day	Did not brush teeth twice a day	Total
Number who have a cavity	6	12	18
Number who did not have a cavity	19	2	21
Total	25	14	39

The above table shows the recent data collected at Dr. Fang's dental office over a two week period. Suppose that event B is "have a cavity" and that event A is "brush teeth twice a day".

a) Calculate  $P(A)$   $\frac{25}{39}$

d) Calculate  $P(A | B)$   $\frac{6}{18} = \frac{1}{3}$

b) Calculate  $P(B)$   $\frac{18}{39} = \frac{6}{13}$

e) Calculate  $P(A | \bar{B})$   $\frac{19}{21}$

c) Calculate  $P(A \text{ and } B)$   $\frac{6}{39} = \frac{2}{13}$

f) Calculate  $P(B | A)$   $\frac{6}{25}$

5. Mr. Batt's foul shooting success rate is 88%. In a game where he shoots 12 foul shots, what is the probability that he will...

a) sink exactly 10 of the shots?

b) sink at least 10 of the shots?

c) sink exactly 1 of the shots?

d) sink at least 1 of the shots?

## Circle Geometry

### 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

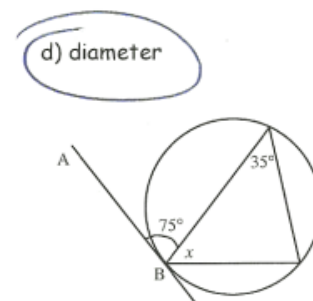
2) In the diagram, AB is tangent to the circle. The measure of  $\angle x$  is

a)  $70^\circ$

b)  $75^\circ$

c)  $110^\circ$

d)  $30^\circ$



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)  $\left(\frac{1}{4}(x-2)\right)^2 + \left(\frac{1}{4}(y+3)\right)^2 = 1$

c)  $(x-2)^2 + (y+3)^2 = 16$

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

### SECTION B: SHORT ANSWER

Put your simplified answer in the box provided.

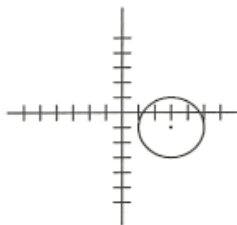
1) A chord 10 cm in length is 4 cm from the centre of a circle. Determine the radius of the circle.

$$\sqrt{41}$$

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.

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

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



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

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

centre:  $(4, 6)$  radius: 4

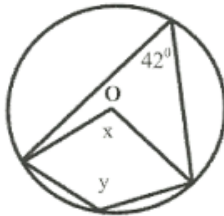
5) The equation of an ellipse is given as  $\left[\frac{1}{6}(x+3)\right]^2 + \left[\frac{1}{8}(y+1)\right]^2 = 1$ . Determine the length of the major axis.

$$16$$

### SECTION C: OPEN RESPONSE

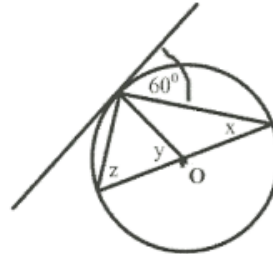
You must show all your calculations to receive full credit.

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



$$x = \underline{84^\circ}$$

$$y = \underline{138^\circ}$$



$$x = \underline{30^\circ}$$

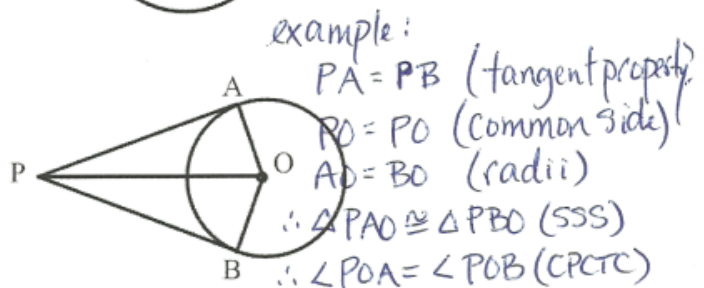
$$y = \underline{60^\circ}$$

$$z = \underline{60^\circ}$$

2. Prove the following.

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

Prove:  $\angle POA = \angle POB$



3. A lighthouse sweeps through an angle of  $138^\circ$ . The light can be seen at a maximum distance of 2500 m. What area is illuminated by this lighthouse?  $7526732 \text{ m}^2$

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

a) Sketch the triangle.

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  $AB$ .

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

slope of both lines =  $-\frac{1}{2}$

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

$$(x+3)^2 + (y-4)^2 = 52$$

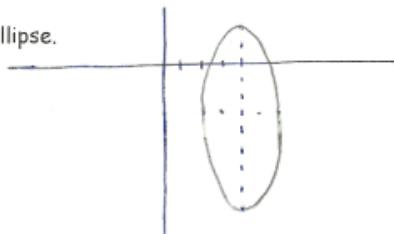
6. The equation an ellipse is given by  $\left[\frac{1}{2}(x-4)\right]^2 + \left[\frac{1}{5}(y+3)\right]^2 = 1$ .

a) Determine the centre of the circle.  $(4, -3)$

b) Determine the length of the major axis. 10 units

c) Determine the length of the minor axis. 4 units

d) Sketch a graph of the ellipse.



## Probability Section C

5 a.  ${}_5C_3(0.88)^3(0.12)^2 = 0.0981$

b.  ${}_5C_4(0.88)^4(0.12)^1 + {}_5C_5(0.88)^5 = 0.8875$

c.  ${}_5C_1(0.88)^1(0.12)^4 = 0.0009$

d.  $1 - {}_5C_0(0.12)^5 = 1.0000$